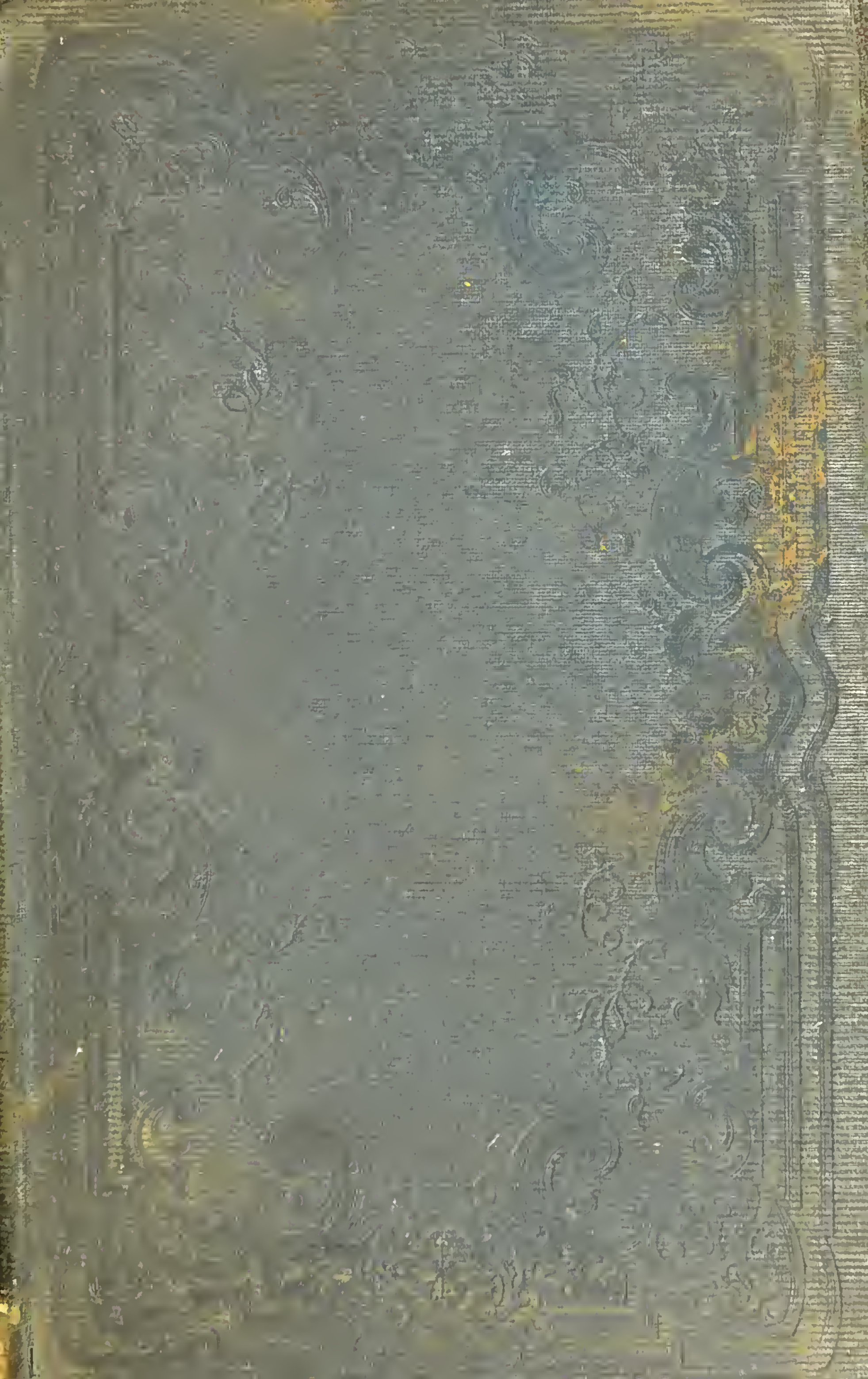


38053/A

K.viii.Mur

19/m

U02
12/6

POPULAR TREATISE

ON

THE HUMAN TEETH.

Digitized by the Internet Archive
in 2015

https://archive.org/details/b22029217

POPULAR TREATISE

ON THE

STRUCTURE, DISEASES, AND TREATMENT

OF THE

HUMAN TEETH;

WITH AN

Illustration of the Present State of Dental Mechanism.

By J. L. MURPHY.

TWELVE FINE ENGRAVINGS.

LONDON:
WHITTAKER AND CO. AVE MARIA-LANE.
1837.

92486

WELLCOME
HISTORICAL
MEDICAL
LIBRARY

PREFACE.

Mankind seems to have been actuated, pretty generally, by a desire to make that which is really simple, profoundly mysterious—that which is superficial and palpable, abstruse and difficult to be understood. Every trade has its peculiar secrets, which are imparted by the elder artizan to his apprentice with a superstitious gravity that is often ludicrous; and these secrets are frequently regarded by the pupil with the most reverential awe. The article of Indenture by which the baker, shoemaker, carpenter, or any other tradesman binds his apprentice to servitude, always speaks of the trade as a 'Mystery.' The professors of law, physic, and divinity, have also highly distinguished themselves in changing the palpable to the mystic.

An opposite feeling to this is daily gaining strength, and eventually must predominate. Almost every day, books of a popular nature are published, in which the object is to explain useful truths in as simple a manner as possible. All kinds of knowledge are useful; but that which relates more particularly to human organization is eminently so. Every art is calculated in some degree to be practised by all, and each has its simpler operations, the knowledge of which, serving as a correct guide to their proper performance, cannot but be beneficial.

In no profession has there been more mystery and empiricism than in that of the dentist; and though many books have been published on the subject of Dentistry, the mysteries have not been exploded by them, nor have the readers been instructed how to perform simple dental operations for themselves. Some of the ingredients for stopping teeth, and the process of making porcelain teeth, have hitherto been secrets unknown to many practitioners, and the want of knowledge on these subjects has been highly detrimental both to the professional man and the patient.

These considerations, the author is of opinion, are sufficient to show that a Tréatise on Dentistry, explaining those things not hitherto generally known, is a desideratum to the public and the profession, though not to either the monopolist or the quack. All the succedaneums that are in use among dentists may be found described in the following pages, together with the methods of preparing them, and the mode of their application. The use of porcelain as a dental substitute is discussed, and the mode of preparing the substance detailed.

Those branches of art that are suited to popular use are explained, and the reader encouraged to put them in execution; but, as correct theory is an essential preliminary to successful operative practice, a sketch of the structure, functions, and diseases of the teeth is first laid down, as a foundation on which to erect an improved practice.

Throughout the work the use of technicalities has been avoided as much as possible, and, in accordance with the spirit of the work, English names for the teeth, and a simple classification of them, have been preferred.

CONTENTS.

CHAPTER I.

Importance of the art and science of Dentistry shewn by a consideration of the relationship subsisting betwixt the teeth and the general organization—Reasons advanced for the universal cultivation of the knowledge of the teeth. PAGE 1.

CHAPTER II.

Classification of the teeth—Structure—Formation of the primary and secondary sets—Organization of the teeth—Remarks on the inference drawn from them respecting the frugivorous nature of man. PAGE 35.

CHAPTER III.

Observations on the causes of dental disease—Malformations of the jaws and teeth—Irregularities of the teeth and jaws—Diseases of the teeth and socket bone—Injurious mechanical and chemical agents. PAGE 71.

CHAPTER IV.

Introductory remarks on the art of Dentistry—Treatment of the primary teeth—Treatment of the irregularities of the secondaries—Treatment of the diseases of secondary teeth. PAGE 101.

CHAPTER V.

Treatment of secondary teeth continued—Treatment of the diseases of the gum and socket bone—Remarks on the usefulness of the art of treating dental disease. PAGE 131.

CHAPTER VI.

Cases illustrative of dental surgery—Cases of prominency of the lower jaw—Cases of confusion of dental position—Exostosis of the root—Gangrene—Grooving disease—Calculus—Abscess of the socket—Miscellaneous cases. PAGE 150.

CHAPTER VII.

Dentistrical mechanism—Artificial teeth—Qualities desirable for them—Rival substances and modes of fixing—Human teeth objectionable—Superiority of porcelain teeth—Consideration of the reasons for their general use as dental substitutes, and of the objections advanced against them—Composition, and mode of preparation—Concluding remarks. PAGE 173.

POPULAR TREATISE

ON

THE HUMAN TEETH.

CHAPTER I.

Importance of the art and science of Dentistry shown by a consideration of the relationship subsisting betwixt the teeth and the general organization.—Reasons advanced for the universal cultivation of the knowledge of the teeth.

One of the most rational views of the importance of the teeth, and the utility, both of the science and the art of Dentistry, may be opened to the mind by pointing out the relationship subsisting between the teeth and the other organs of the body. Indeed, if the knowledge of the human structure were more generally diffused, and that of the organic operations, on the proper performance of which not only our happiness but our life depends, were more widely cultivated, the teeth, along with the other organs, would receive a greater portion of care, attention, and respect, than has hitherto, generally speaking, fallen to their lot.

As a very few pages will suffice to give a slight outline of the more important organs and their functions, and as such an outline may be of use, not only in leading to the perception of the relationships alluded to, existing between the teeth and the rest of the body; but, also, in being a most essential preliminary to a more minute inquiry respecting the formation, structure, and diseases of the teeth; we shall devote a short space of time to the consideration of this subject.

The human system consists of bones, muscles or organs of motion, brain, and nervous system or organs of thought and feeling; organs of assimilation, as the teeth, stomach, and duodenum; organs of circulation, as the heart, and blood vessels; organs of absorption and secretion, as the absorbents, and secretory glands. Throughout the solids of the body there is a cellular substance connecting all parts together: it bears some analogy to honeycomb, and so general is it through the system, that Blumenbach remarks, "that this membrane is so fundamental a constituent of our structure that were every other part removed and it to retain its position, the body would still preserve its form."

The bones have been, by some writers, likened to the foundation or supporting principle of the fabric, and in the animal kingdom they vary in shape, and in their joints, so as to be susceptible of the peculiar motions of the animal to which they belong. Though their substance is exceedingly dense, yet they are sufficiently porous to admit of minute blood vessels, nerves, and glands, which ramify in every direction throughout their structure.

The red or lean part of the body called muscle, is composed of minute fibres bound together in the cellular substance. These fibres being endowed with the property of irritability, and their cellular substance with that of contractibility, qualify the muscle to perform its function of motion. By these two principles all our muscular motions take place, from the most violent exertion to the mere act of closing the eyes. By irritability is meant the susceptibility to be acted on by a stimulus, possessed by the muscle, and by its contractibility, its power of shrinking on the application of the stimulus.

The brain or organ of thought and feeling, has, by means of the nerves which communicate with all parts of the system, the greater quantity of these muscles under perfect command, and an act of the will regulates most of the movements of the body, with an instantaneous precision, by communicating a stimulus through the medium of the nerves to those muscles, the contraction of which, will bring about the desired movements. It is supposed by modern physiologists that this stimulus is a subtle fluid of a similar nature to electricity, which, being elaborated by the brain, from the blood, is forwarded in an act of volition by means of the nervous conductors to the muscles to be excited. Muscles of the most important nature such as the heart, and those that perform the peristaltic motions, have been wisely made independent of the will, and act involuntarily: if it were otherwise, life would be continually endangered from the mere caprice and want of attention on the part of its possessor.

From the brain arise nine pairs of nerves, and from the spinal marrow, which is an elongation of the brain and is sometime spoken of as its tail, arise thirty pairs. Each nerve is composed of a number of minute threads, in the same manner that a piece of common cord is composed of minute fibres of flax; or, more properly as a skein of thread, is made up of individual threads. Every fibre acts the part of a conductor independently of those bound up together with it, and in this feature there is a striking difference between the nerves and blood vessels; whenever one of the latter divides into smaller vessels, the fluid flowing from the larger, divides, and passes into the smaller; but, when a nerve divides, there is merely a division of minute threads, each of which is an independent conductor communicating the brain with a certain point in the structure. The nerves divide, and subdivide, till they spread themselves throughout the whole system, so that no part of the body is without their presence.

They convey sensations from all parts of the organization to the brain, and from the brain they communicate the stimulus before alluded to. If the nerves were canals similar to the blood vessels the fluid on passing from the brain could not be directed to the proper point, but all the muscles that the main branch of the nerve communicated with, by its branches and ramifications, would be stimulated, excited, and contracted; whereas by the mode in which they are constructed, sensation is communicated with the greatest exactness, from the different parts of the body, by the distinctness of the threads, and any particular muscle or set of muscles can be stimulated, and the most subtle movements, such as those of the fingers in playing the piano or harp, or in writing or drawing, performed with the utmost exactness.

The bones, muscles, brain, and nerves are subject to waste in consequence of their action; and also the materials of which they are composed, to be enabled to support life, must be made independent of the chemical laws of fermentation and putrefaction. To render them thus independent a continual change must be kept up in the matter of which they are composed: fresh materials are to be supplied for the support of the fabric, and the old worn-out matter thrown out from the system.

For the purpose of removing the old matter, there are in every portion of the body, minute organs, called absorbents, whose office it is to change the older particles into lymph, and remove this lymph into the veins. The hardest bones, as well as the flesh, are continually being melted away by these lymphatic absorbents.

To make up the loss of matter sustained in consequence of the continual action of the absorbents, as well as that occasioned by waste, the power of assimilating other substances with itself is essential to a living being —no animal, no vegetable can subsist without this power. The change of matter must be kept up to avoid putrefaction, and as the old parts are taken away, new must be supplied. To do this, organs have been given to all living beings. The first operation which the human food undergoes in effecting the series of changes, by which it is converted from being food, to be blood, bone, and flesh—is that of mastication.

This operation consists in grinding the food into small atoms by means of the teeth, which would be rather an unpleasant task, if it were not for the assistance of the fluid called saliva, which is poured out from various glands situated throughout the mouth. The function of these salivary glands is to extract from the blood the juice called saliva, with which they are continually moistening the mouth; the slightest motion being sufficient to stimulate them to action. The presence of any foreign substance in the mouth acts as a violent stimulus to them; and during the process of mastication they pour forth their lubricating juice like a number of fountains.

The food being ground and saturated with saliva is, by the assistance of the organs of deglutition, conveyed into the stomach, where, its presence acting as a stimulus to the glands of the stomach, in the same manner that it had formerly acted to those of the mouth, a secretion of gastric juice is caused, which soon acts on the masticated and salivated pulp, changing it to a greyish pulp called chyme. This second change having taken place in the food, it is expelled from the stomach into the duodenum, where it is acted on by the bile, a juice extracted from the blood by the conglomerate gland, the liver, and, also, by another juice extracted by the glands of the pancreas, called the pancreatic juice. These cause another change in what formerly was food. A separation takes place in the chyme; that part that is suitable for the nutrition of the system becomes a whitish fluid called chyle, and is absorbed from the surface of the bowels by the lacteals, and by them conveyed into the thoracic duct, from which it is thrown into the current of the blood. This chyle has yet to undergo another operation and change before it is capacitated to perform the office of nutrifying the system; but, this last change, being effected by its circulating through the lungs, will be mentioned in describing the circulation.

There are two circles of circulation in the system, the greater and the lesser. To perform the greater circle, the blood, of a bright red colour, richly laden with new matter for the repair of the wasted bone, muscle, brain or nerve, is propelled by the contraction of the left cavity of the heart into the aorta, which divides into branches, and then subdivides and ramifies through the whole system; and performing in its course the function of nutrition, it reaches every point of the structure. When this function is performed the minute hair-like vessels bend back upon themselves, lose the structure of arteries, and assume that of veins, directing their course back towards the heart. The blood which has lost its vermilion hue in its passage, and is no longer qualified to perform the function of nutrition, returns back to the heart by means of the veins, the branches of which gradually uniting collect it from all parts of the system into two canals, which empty their contents into the right cavity of the heart. This innutritious blood is mixed with the particles which have been converted into lymph by the absorbents, and, also, the matter, designed for the support of the system, called chyle, has been thrown into it.

The lesser circle of circulation is from the the right side of the heart by the pulmonary artery, which, entering the lungs, divides itself into the most minute channels. These at their ultimate points lose the nature of arteries, assume that of veins, and, gradually uniting, make for the left side of the heart. The venous blood having been propelled through this lesser circle of circulation, by being exposed to the action of atmospheric air in the lungs, assumes its bright red colour and nutritious qualities again; the chyle by the same process becomes changed into blood; the lymph having had its bad particles exhaled with the breath also becomes sanguified; and the blood being carried to the left side of the heart, is propelled into the aorta, and commences the great circle of circulation.

All the solids of the body are formed from this fluid; even the most dense bones are continually being absorbed, and require repair; and this arterial blood flowing into the structure yields the requisite nutrition, while the veins returning back carry away the absorbed particles.

Enough has now been said to show that the whole organic structure is dependent on its power of assimilating other substances with itself. All the phenomena of life are consequential to this power; it is by it, in fact, that we exist. Now the fact, that in the series of operations which the food undergoes to be changed into that nutrient fluid the blood the first is that of mastication, is sufficient in itself to excite curiosity with respect to the organs by which it is performed,—namely, the teeth; but, when we are informed that our brain, nerves, bones, and muscles, have all been transformed from being other susbtances to be what they are, partly by means of the teeth, how importantly does every part of the body appear related to them!

The relationship subsisting betwixt the teeth and the other organs of assimilation is, also, worthy of consideration. The highly talented author of the *Physiology of Digestion* thus speaks of the derangement occasioned by the disregard of this relationship:—" When unmasticated food is introduced into the stomach, the gastric juice acts only upon its surface, and other purely chemical changes sometimes commence in its substance before its digestion can be effected. Hence often arise, especially in children, those pains and troubles, that nausea and acidity, consequent on the continued presence of indigested aliment in the stomach. By a peculiarity of constitution, however, the stomach will not long retain food which it cannot dissolve. After a number of hours,—varying, according to the state of health, from one or two to ten or even twenty,—it is either rejected by vomiting, or transmitted unchanged to the intestines, where its presence irritates and gives rise to cholic, flatulence, bowel complaints, and, in delicate children, not unfrequently to convulsions."

Numerous reasons can be advanced for the general cultivation of the knowledge of the teeth, one of which is, that one of the most agonizing pains that humanity is subject to is toothach, which is generally occasioned by a neglect and disregard to these organs, arising altogether from ignorance of their nature. Every one is liable to the pain; indeed, it may be said, that in the present state of nearly general ignorance relative to this subject, almost every one is certain to be afflicted with it some time or other, and until this want of knowledge be removed, the want of rational treatment, which is the principal cause of disease in the teeth as well as the rest of the body, will be continued.

Another reason for the acquirement of a knowledge of the principles of Dentistry, which is, perhaps, with most people a greater motive than the one just advanced, is that the teeth form so important a feature in the face, that no person can by any possibility be deemed comely who is possessed of a discoloured and irregularly formed set. Nothing can be more objectionable, not only on account of the appearance, but, also, from the offensive fetor arising from diseased teeth; for being continually exhaled, the breath becomes the source of the most sickening annoyance to all around.

The utility of Dentistry as a science consists in making us acquainted with the causes of those painful, offensive, and disfiguring diseases which at present have so distructive an influence in most mouths; and by thus rendering us acquainted with the causes, it in some respect qualifies us to avoid them.

But it may be asked of what utility is the knowledge of the practical part, or art of Dentistry, to those who are not dentists. To this question may be given the answer, that all persons ought to be dentists in some degree. Each individual is more interested in the preservation of his or her teeth than any other person, and the mass of operations on these organs, being performed by their possessors, is a sufficient reason for their being duly qualified. Besides, how necessary is it, in the present times of quackery and imposition, that people, before they apply to a regular practitioner, shall be enabled to detect the difference betwixt empiricism and skill.

How frequently do we meet with persons who have been grossly imposed upon for want of a little experience on this subject! One gentleman tells us how Mr. A., the celebrated dentist in London, performed an operation on his teeth, and by the application of a liquid made them for the time of a beautifully transparent white colour; but that very shortly afterwards rapid decay commenced, and that now, though several have been extracted, he is suffering the most excruciating torment.

Another sufferer, a lady, will descant upon the "little fortune" she has laid out on her teeth. Monsieur A. destroyed them with acid, and for doing so she paid him twenty guineas. Mons. B. attracted her attention by his extraordinary advertisement, and she paid him forty guineas for a set of artificial teeth that she never has been able to wear an hour without pain, which consequently were soon thrown aside. Mr. C., Mons. D., and Mons. E., with a dozen or two others, have been successively employed, and have successfully victimized this unfortunate lady. Some persons on applying to a dentist to have their mouth examined, are surprised after having their teeth just touched with a scaling instrument by the astounding intelligence, which is communicated with all the *sang froid* imaginable, that the charge is "*only ten sovereigns.*" Such conduct as this has latterly been not uncommon amongst *professional gentlemen*; but, owing to the resistance of some of the male portion of the species to the scandalous impost, and the public exposures that have taken place before the magistracy, the plunder has been commonly confined to the more timid and delicate sex, members of which are often imposed upon in the most outrageous manner.

These cowardly robberies are generally perpetrated by persons whose characters are easily discoverable from the barefacedness of their quackery, and a slight knowledge of the art of Dentistry will enable people to make this discovery with ease, and thus guard themselves and their pockets against the impositions of knavery.

When any extensive loss of teeth has taken place, the power of mastication being impaired, the individual must abstain from the use of solid food, or take the consequences of swallowing indigestible lumps. Besides this there is a want of distinct articulation, and a difficulty in speaking that is painful to the listener as well as the speaker.

Persons in this state are necessitated to use artificial teeth; sometimes for the restoration of their health, and at all times for the increase of their enjoyments; if any thing can be more miserable than not being able to eat comfortably, it is that of being unable to communicate our thoughts and express our feelings without painful exertion.

In circumstances of this nature artificial teeth become indispensible,—the assistance of an expert artist is required; but the discovery of such a one is a matter of a little difficulty. If a dentist be an honest man, and a good artist, he can have no reasonable objection to warranting his work; or, indeed, if the applicant to him be of well-known respectability, he cannot object to allowing a fair trial of his work previous to payment; so that this may be considered a very fair criterion to go by. If a dentist refuses to allow such a trial of his work, he domonstrates one fact of importance to the applicant; that is, that he is very doubtful about its success, and this with any one of common sense is a sufficient reason for consulting another professional man.

Dentistry, as a profession, is open to any one. In fact, an adventurer, in want of a means of livelihood, has nothing else to do than get together a few instruments, a little broken English, a considerable quantity of effrontery, a French name for himself, and a Latin one for the material with which he '*renovates*' teeth, to commence practice as a dentist, and astonish the world by means of flaming advertisements in the newspapers, placards on the walls, and handbills in the streets, in all of which the advertiser, with original modesty, informs the inhabitants of whatever town he for the time is located in, that he is decidedly the most extraordinary personage, in his way, that ever honoured them with a visit. Such a man as this will often make a fortune, though he never sees the same patient a second time, unless it be to try to get the fees returned. The success that people of this character meet with, both in medicine and dentistry, is entirely owing to the multitudes of fresh dupes that are continually flocking to them, and it is only by means of the general diffusion of information on these subjects that people can be sufficiently enlightened to avoid being so grossly imposed upon.

In the crowded and busy state of society which at present exists in England, all that a professional man requires, to have an extensive practice, is to be well known, or to be long established.

These remarks are applicable to trade, as well as to professional men; but it is only necessary here to consider them with respect to Dentistry. Now to be well known as a dentist does not at all signify ability, some of those who are best known, are those of jaw-breaking notoriety; and though almost every town in his Majesty's dominions is possessed of a practitioner of this class, still, strange to say, his celebrity does not at all decrease his practice; nay, on the contrary, it seems that the more he is known, the greater is his practice increased. This arises from persons never giving the slightest consideration to their teeth till violent pain commences, when, of course, they enquire for a dentist—are most probably directed to that one that is best known, and, without any further information, hasten to have the operation of extraction performed. Being well known as a dentist of considerable practice is, therefore, not a sufficient recommendation for a patient wishing to discover a clever practitioner.

A long establishment signifies, in some degree, that the established person is elderly, and if this be the case, it is most probable that the elderly gentleman practises what was

Dentistry many years ago: such a one will recommend with great gravity of countenance, seahorse tusks, and monkeys and dead-men's teeth as substitutes for those which his patient has lost. This recommendation might be treated with ridicule, if it were not for its disgusting and serious tendency. There is something of a horridly revolting nature in the idea of having in one's mouth a lot of foul, dead-men's teeth, torn from the putrid jaws of a corps, by the sacraligious hands of a resurrectionist. But this is not all; the teeth of the dead (when they have any) are generally old and worn out by medicine and disease; these, therefore, are not so often suitable for use; or, at least, the supply which is gained from the grave is not commensurate with the demand in the tooth market. For this reason high prices are offered for human teeth; between one and two guineas are to be had at any time, from the dentist, for six handsome front ones of the upper jaw. Now, many a man has been led to commit murder by a smaller pecuniary motive than this, and those who have read the trials of Bishop and Williams are aware, that one of the reasons that induced these men to become murderers by profession, was the fact, that they received high prices for the teeth of their victims, as well as for the bodies.

But the inhuman outrages that take place in consequence of the use of human teeth, are in some instances of a more horrible nature still. The value of teeth is made known, by a set of wretches who supply the dentists, to a band of harpies that hangs about any unfortunate country which is the seat of a war, and make it their business to procure the teeth of the soldiers who have been wounded or killed in a battle. The dying soldier is frequently tortured by having his jaws knocked in, and the alveolar processes broken in the most brutal manner, perhaps by his own comrades, or the prostitutes who follow the camp, many of whom make considerable sums by this horrid work. The motive which leads them to do it, is the price paid by those persons who use human teeth.

Any one who doubts this statement may have his doubts removed at once on application to a tooth vender; let him assume the character of a dentist, and apply to one of these traders, who are plentiful in London, and may be discovered by enquiring amongst the dentists who use natural teeth. On coming in contact with the tradesman, the enquirer will be told of 'a splendid stock of teeth just arrived from Spain,' or some 'beautiful sets from the South Seas;' and, on getting into conversation, he will, probably, hear how many hundred sets of Grecian teeth were sold, a few years ago, to some great dentist in the metropolis, or some country practitioner of celebrity. On looking over the stock, he will perceive some lots that have not the beautiful white appearance of the others, these he will be told are 'English grave teeth.' How horrible is all this! And yet it is no less true than horrid!

If a practitioner be of the old school he is a promoter of all this iniquity; and, also, he recommends to his patient a dead bony matter which, after being in the mouth for some length of time, decomposes, becomes foully putrid, and smells most abominably. How shocking is the idea of having bones, abstracted from a dead corps, thurst into one's mouth, and kept there till they putrify, and dissolve away! When natural teeth become completely fetid and rotten,—when they change to a mass of black decomposition, they are by the elderly professional gentlemen technically said to be '*worn out*,' which means that they require to be replaced by other teeth, the greater part of them having been exhaled with the breath in effluvia, or else inhaled into the lungs, or swallowed with the saliva and food into the stomach. Those who eat human flesh are called cannibals; the devourers of human bones have not yet received a cognomen!

Reader, if ever you apply to a practitioner, and he insults you by recommending natural teeth for your use, address him thus—'Pray, Sir, do you wish to make my mouth a sepulchre for human bones? Do you wish that their poisonous effluvia should be inhaled and exhaled with my breath? Do you wish to assimilate me with cannibals? Do you desire me to become a coadjutor with you in encouraging murder, resurrectionism, and the most cowardly violence and criminality? He will no doubt take some time to recover from the stupefaction induced by these questions, and when he has recovered, he cannot answer them satisfactorily; therefore leave him.—Leave him to reflect upon his immorality. Perhaps he is a thoughtless, silly man, and has never once perceived the guilt of his practice; if so, his imbecility may be advanced in palliation of his enormity; but at all events *leave him*, unless he promises to reform.

If a person, in want of a dentist, have a medical friend of known discretion, and independence of spirit, he, perhaps, would be exceedingly well qualified to say who is a respectable dentist; but the very best guide is the individual's *own private judgment*, if it be properly cultivated.

The knowledge of Dentistry, to parents, may be considered as indispensable. They *ought* to be qualified to watch over the gradual development of their children's teeth. They ought to be capacitated to perceive when any malformation is taking place, that the causes of it may be removed in the incipient state. If parents were possessed of dental knowledge, deformity of the mouth, caused by irregularity of the teeth, might be altogether obviated, and the suffering of their offspring in a great measure prevented. Indeed, the knowledge of the principles of Dentistry cannot but be generally beneficial, and if so, the perusal of a few chapters, purporting to explain those principles, may prove of some little utility.

CHAPTER II.

Classification of the teeth—Structure—Formation of the primary and secondary sets—Organization of the teeth—Remarks on the inference drawn from them respecting the frugivorous nature of man.

One of the greatest obstacles to the communication of scientific knowledge, and, therefore, one of the greatest misfortunes that science has met with in modern times, is that of having the names, or terms common to the sciences, given, not in the language of the reader, but, in the majority of incidents, in a tongue completely unknown to him. Scientific terms are generally derived from the Latin, or the Greek, and these being 'unknown tongues' to the majority, difficulties, confusion of ideas, and mistaken conceptions arise, which every one will admit must be barriers in the way of progressive improvement. Anatomy is wofully encumbered with these, to the majority, unintelligible names; and though, more than once, hints have been thrown out by able authors, with respect to the necessity of a sweeping reform in the terms of this and most other sciences, still, unfortunately, the old names are retained.

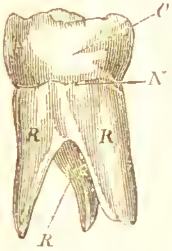
The anatomists have named the teeth as well as the other organs of the body, and of course the terms they have given are classical. The four front teeth have by them been called 'incisores;' because, perhaps, they fancied they bore a resemblance in their operations to a Roman carver, the name appropriated to such a functionary being *scissor*. The teeth next to these, commonly known by the name of the eye teeth, have been termed 'cuspidati,' from *cuspis*, a spear, javelin, arrow, or rather the point of any of these; and the next to the cuspidati have been called 'bicuspides,' from imagining one of their crowns to resemble a double headed spear; the grinding teeth have received the extraordinary cognomen of '*molares*,' or mill stones! These metaphorical names, based on imaginary resemblances, are sometimes very pleasing in poetic writings; and, if we were to read a poetic description of a huge giant whose teeth were metaphorically spoken of as spear heads, mill stones, and double spear heads, though the last name would be rather unintelligible, still the good natured reader might allow all to pass without censure. This figurative language, however, is ill adapted for science, the terms in which ought to be intelligible and appropriate.

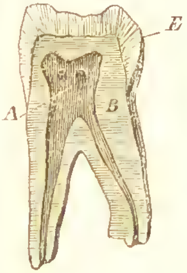
It may safely be said, that most of our anatomical terms owe their continuance in use to their meanings being unknown to the mass of society; if it were otherwise—if every one was qualified to construe the terms,—so ridiculous, so absurd, in many instances, must they appear, that they would be treated as a universal laughing stock till their memory was buried in oblivion.

The name of an organ ought not to be derived from its similarity to other objects; but rather from the function which it performs; and, acting on this principle, the teeth may be divided into two classes—cutting teeth and grinding teeth.

The cutting teeth are twelve in number, six in the upper, and six in the lower jaw; they are situated in the front of the mouth, in shutting which, the lower cutting teeth generally close at the inside of the upper. By this means, in biting food, they cut in a similar manner to a scissors or shears. All the rest of the teeth are used for grinding food; and, therefore, may very appropriately be termed grinding teeth.

The greater part of the tooth is composed of dense bone, (B); but that portion which is intended to be above the gums, and bear the action of mastication, is covered by an exceedingly hard crystaline matter called enamel, (E). The part covered by the layer of enamel is termed the crown of the tooth, (C); that, about where the enamel ceases, the neck, (N); and the rest, the root or roots, (RRR). In the centre of the bone is a cavity, which commences in the crown of the tooth and terminates in a small aperture at the end of the root or roots, (A). This cavity is similar in shape to the tooth in which it is contained, and is lined by a membrane called the periosteum, which membrane covers a pulp containing an artery, vein, and nerve, which enter the tooth by the aperture at the end of the root, and ramify into the bony substance communicating to it vitality. The first of the following explanatory figures represents a grinding tooth; the second, half of one, split so as to show the internal structure:—



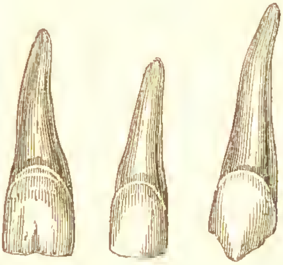


The roots of the teeth are firmly implanted in sockets formed on the jaw bones; at the bottom of each socket is an aperture sufficiently large to admit of the entrance to the root of the tooth of an artery and a nerve, and the consequent exit of a vein.

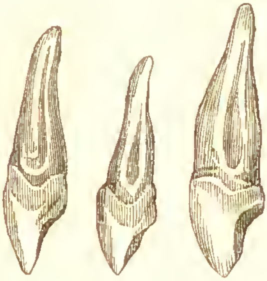
The spongy substance of which these sockets are composed forms part of the jawbone, and has been called in anatomy *alveolus*, or a chessboard, from its having holes in it similar to an ancient chessboard.

The internal part of the socket is, in a similar way to the internal cavity of the tooth, lined with a fibrous coating called periosteum; this periosteum is reflected on the roots of the teeth, and binds them firmly in the sockets.

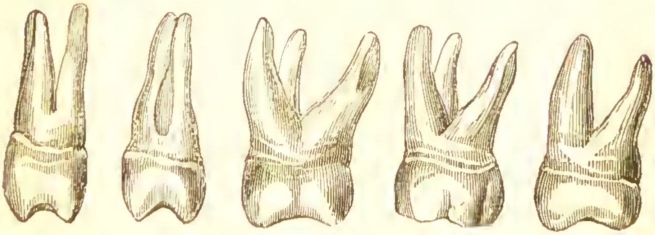
In the course of existence nature supplies us with two sets of teeth; the first for infancy, the second for maturity. The first set is composed of twelve cutting teeth and eight grinding ones; the second of twelve cutting teeth and twenty grinding ones. All these are from resemblance to one another connected in pairs. The two front cutting teeth in the upper jaw are similar in form; the two next to these, called the second pair of upper cutting teeth, are also similar in form; the eye teeth, or third pair of upper cutting teeth, and the first, second, third, fourth, and fifth pairs of grinding teeth, are arranged in pairs from their natural similarity. The same association takes place in the lower jaw; and this being understood, the reader will perceive that it is not necessary to give more than one of each pair in the figures. The following are front views of the left upper first, second, and third cutting teeth:—

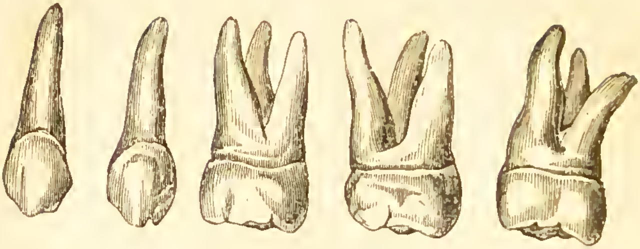


The following are side views of the same teeth:—

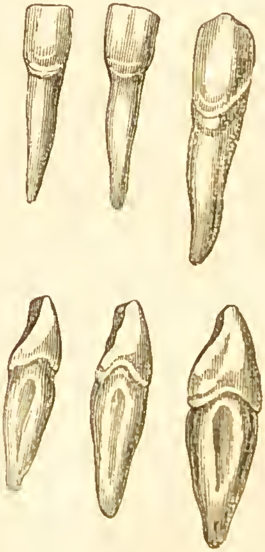


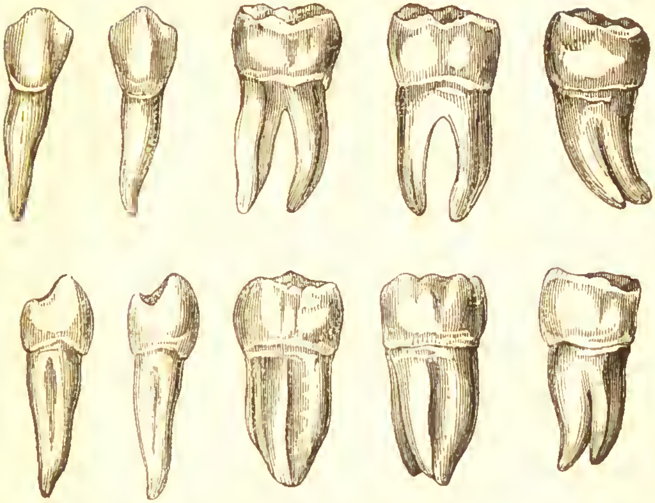
Views of the lateral and outer sides of the left upper grinding teeth:—





The under jaw teeth differ much from the upper in shape, and in the cutting teeth in size, as will be perceived by an examination of the following:—



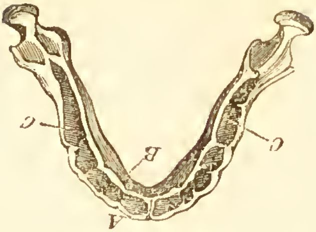


A slight examination of these figures will show the difference of shape amongst the teeth. The twelve front are sharpened at the edge for the performance of their functions of cutting. The first and second pair of under ones are much smaller than their antagonists; by this means they are enabled to form a smaller arch than the upper, and close at the inside of them. The first and second pairs of grinding teeth in the upper and lower jaws differ from the third, fourth, and fifth pairs in being much smaller. The number of roots, together with the different shapes, form striking distinctions in the teeth, which, however important they may be to the professional dentist in enabling him to apply his extracting instruments with accuracy, would be useless and, if described, tedious to the general reader.

The spongy portion of the jaw bones, of which the sockets of the teeth are composed, has its outer surface covered over with the red substance called gum, which embraces the necks of the teeth, passing between them across the bony partitions of the sockets. It is not very susceptible of pain when healthy, but becomes excessively irritable in a state of disease.

To have a conception of the influences to which the teeth are subjected, it is necessary to trace them from their origin, through the various changes by which they have been gradually developed, and having considered the circumstances by which they are formed, the real causes of their derangement and decay will appear more obvious, and a more correct mode of general treatment be suggested to the mind than could be in the absence of the knowledge of the facts respecting their formation.

The history of the teeth commences at the earliest period of organic existence; indeed, the preparatory steps for their formation are plainly discoverable in the fœtus of eight or nine weeks old. At this early stage, the top or edge of the lower-jaw arch, and the bottom or edge of the arch of the upper jaw are covered with a jelly-like substance, or pulp, the sides of which appear gradually to ossify, and thus form the first step towards the formation of the outer and inner plates of the jaws, and these plates attempting gradually to connect themselves by transverse shoots, the groove between them, which contains the pulp, becomes separated into cells, each of which contains the rudiments of a tooth. Thus ere the termination of the fourth month of fœtal existence the jaws are distinctly formed, the partitions of the sockets are in progress, and the formation of the teeth begun. The following wood cut represents the under jaw of a fœtus at this age divested of the gum. (^{A}) is the outer plate, (^{B}) the inner one, (^{CC}) the groove, being divided into separate partitions, in which are contained the rudiments of the teeth:—



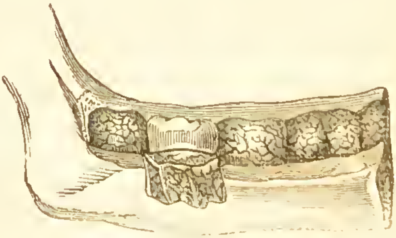
At the bottom of the groove run the blood vessels and nerves which animate and nutrify the fœtal teeth, and upon these, in their distinct chambers, rest small sacs containing the pulpy substance which formerly occupied the whole groove, but which, at this age, is separated by the transverse partitions, and enclosed in its different chambers in membranous bags, thus having formed a number of separate pulps, each of which is destined to become a tooth, and is similar to one in shape.

The deposition of bone first takes place on those parts of each pulp, which become the most prominent points of the grinding or cutting surface of the tooth, and the ossification gradually extending itself, at the time of birth, forms a little cap upon the pulp, which cap is the outer bony layer of the crown of the tooth.

The ossific matter which forms the bone of the tooth, is deposited by a thin membrane which covers the pulp, and is closely attached to it by numerous blood vessels, both it and pulp decreasing as the progress of ossification proceeds; so that when, at length, the substance of the tooth is completed, the membrane and pulp are confined to the small canal in the centre of the bony structure.

The enamel is deposited on the teeth from the investing sac, which forms a covering to the crown and attaches itself about the apertures at the bottom of the pulp where the vessels enter. This sac is composed of two coats, the external and the internal, about the vascularity of which there was formerly a difference of opinion among dentists; but the fact of their both containing vessels was proved by Mr. Fox who succeeded in injecting them.

When the layer of bone forms the shell-like covering of the pulp, and has extended itself down to the neck of the tooth that is in the process of formation, the sac becomes firmly attached to the neck, though loosely about the crown, and that part about the crown being in connexion with the gum, receives from it a supply of vessels. Shortly before the secretion of enamel takes place, both the coats of the sac, but particularly the inner one, become more filled with blood, for the purpose of supplying the crystalline matter to be extracted from it; and from the internal surface, the deposition of a fluid takes place upon the bony cap of the tooth, which soon hardens into a dark substance, and ultimately crystallizes into the white enamel covering the crowns of the teeth. The annexed wood-cut represents part of the lower jaw of a child at birth, dissected so as to show the sacs, one of which is removed to show the tooth in its progress of formation, the crown being completed :—



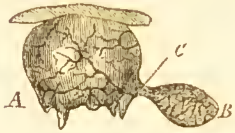
There is a singular principle connected with the vital substance of living beings, that is, that when a continuous pressure is caused in any part, it is gradually taken away by the action of the absorbents, and is therefore said to be absorbed. Now, when the crown of the tooth is formed, the dense structure of the enamel coming in contact with the investing sac causes pressure upon it, and gradually removes it, the absorbents taking it away by small atoms at a time. When, by this process, the greater portion of the sac has been absorbed, the crown of the tooth causes pressure upon the gum, and by the action of the same principle, the opposing part of it is also removed, and the teeth make their appearance in the mouth.

Any rules that may be laid down, with respect to the protrusion of the teeth through the gum, are liable to considerable exceptions; but though the infant is sometimes born with the teeth thus protruded, and though sometimes they do not make their appearance till the second or even the third year, yet still rules do exist which are applicable to the majority of cases.

As soon as the child has attained its fifth month the protrusion of one of the lower front pair of cutting teeth generally soon takes place, the next one to it shortly following, and in the course of a few weeks, one of the upper pair, and then its fellow; the whole four being cut before the termination of the eighth month after birth. Between the seventh and tenth month, first the under, and then the upper second pair of cutting teeth, may be expected to appear through the gums. From the twelfth to the sixteenth, the four first grinding teeth, and from the fourteenth to the twentieth month, the four eye teeth or the under and upper third pairs of cutting teeth. Lastly, from the eighteenth to the thirty-sixth, the under and upper second pairs of grinding teeth, which complete the primary set; making in all twenty—twelve being cutting teeth, and eight grinding ones. These four pairs of infant grinding teeth are larger than the first and second upper and under pairs of the adult set, by which they are succeeded, and which have been sometimes called the small grinding teeth.

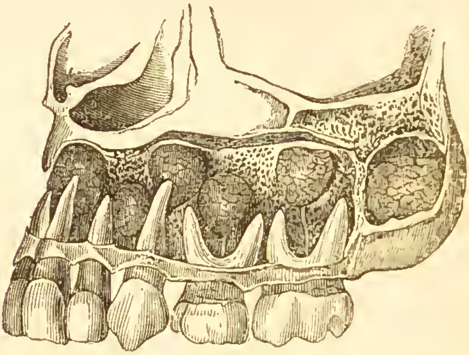
The secondary teeth are of a stronger texture than the primary, and take a much longer time for their formation. From the time of conception to the completion of the primary teeth it is seldom that a period of more than four or five years elapses; but the case is very different with the secondary teeth, the formation of which, commencing before birth, and the complete evolution seldom terminating before the five and twentieth year, and often not until an advanced period of life.

Shortly after the formation of the primary teeth has commenced, the investing sac gives off a small bud which, gradually increasing, forms a new sac in which is contained the elements of the secondary tooth. This process, by which the teeth are propagated, is somewhat analogous to that by which in the vegetable world the potato produces its kind. The bud springs from the back part of the primary sac, and, gradually extending itself, at length separates from its parent, and occupies a fresh cavity in the alveolar process; still, however, it is connected by means of a cord with the primary sac. (A) represents the sac in which the primary tooth is being formed; (B) the bud or new sac in which the secondary tooth is to be formed, (C) the cord:—



Each of the primary teeth produces for itself a successor, and thus are twenty of the secondary, or what are called the permanent teeth, originated. But in addition to these, in the adult set, there are twelve large grinding teeth which are not the offspring of the first set. The third grinding teeth are the largest in the mouth, and may be said to be contemporaneous in their origin with the primary set, their sacs being formed from the same pulp. These sacs give off-branches, which produce the sacs of the fourth pairs of grinding teeth, and these reproduce the sacs of the fifth pairs, or wisdom teeth.

Those who have written on the formation of the teeth, seem generally to have held the opinion, that the secondary teeth are all propagated by the primary; Mr. Bell, in praise of whose book too much cannot be said, uses the following language:—‘The rudiments of the permanent teeth, instead of being original and independent like those of the temporary, are, in fact, derived from them, and remain for a considerable time attached to, and intimately connected with them.' Although I consider Mr. Bell as one of the greatest ornaments to the surgical branch of the profession in the present age, and deem his opinion worthy of the greatest respect, yet still in the present instance I am necessitated, however unwillingly, to differ with him altogether; an anatomical examination of the fœtal jaws being, in my opinion, sufficient to demonstrate that the third pairs of grinding teeth are original, and perfectly independent of the temporary set, and if these be thus independent, those arising from them (namely, the fourth and fifth pairs of grinding teeth) are so; making in all twelve permanent teeth that are independent of the temporary set, and can neither be said to be derived from, nor attached to them. The following is a representation of the side of a child's upper jaw, dissected so as to show the sacs of the permanent teeth; those which are to succeed the primary teeth being connected to their parents by cords; but the third grinding-tooth sac being completely unconnected with, and independent of, any of the first set:—

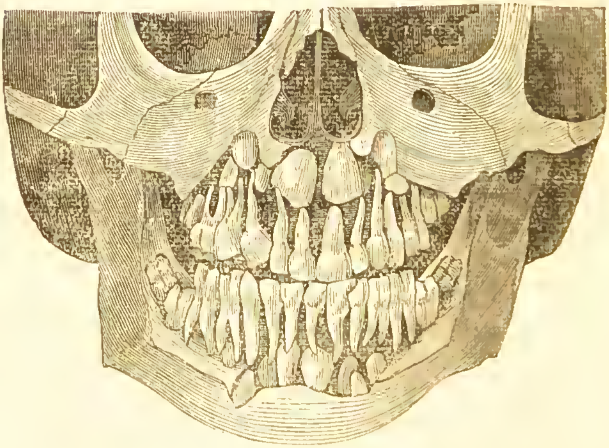


The cord, which has connected the secondary sac with its parent sac, continues to exist after the latter has been absorbed. When the primary set have taken up their proper masticating position in the jaws, their sacs have entirely disappeared; but the cord is found to be firmly attached to the back part of the neck of the tooth, and also is connected with the gum.

It is by this connexion with the gum by means of the cord, that the secondary sac receives its supply of blood, from which it extracts the enamel of the permanent tooth. This latter fact ought to be paid particular attention to, because, if the teeth be not well enamelled, it is impossible that they can be very durable, and unless the connexion be kept up betwixt the gum and sac the enamel cannot be deposited. This connexion is often severed by an unskilful use of the lancet to the gums in infancy, and more frequently by the untimely extraction of children's teeth; for the cord being attached to the back of the tooth as well as the gum, in extraction it will most probably receive serious injury, if not entirely ruptured asunder.

The alarming symptoms sometimes produced in an infant by the irritation of teething, frequently necessitate the medical man to use a lancet to the gums, and this may be done not only with impunity to the teeth, but with considerable benefit to the general system if the operator understands the anatomy of the parts, of course, keeping his instrument from the inner side of the jaws, an incision in which parts would have the effect of severing the cords without relieving the painful symptoms.

The only cases which warrant the extraction of children's primary teeth, previous to their roots being absorbed, are those where intense pain is experienced by the patient, and if the suffering can be relieved by any milder mode of treatment, it is preferable to adopt it. At the age of six years, all the secondary set, except the wisdom teeth, are more or less ossified, and many enamelled; so that, allowing this exception, we may count twenty-eight permanent teeth, which are in the gums, though yet unseen; and if we add to this number that of the primary teeth which are in sight; the total number in the jaws at this age will be forty-eight, some of which are to be seen in the annexed engraving:—



Soon after this time the third grinding teeth make their appearance through the gums, immediately behind the second primary ones, and in a short period afterwards the under and upper front pairs of cutting teeth begin to loosen. This is caused by the absorption of their roots in consequence of the pressure occasioned by the secondary teeth which are advancing to take up their position in the mouth.

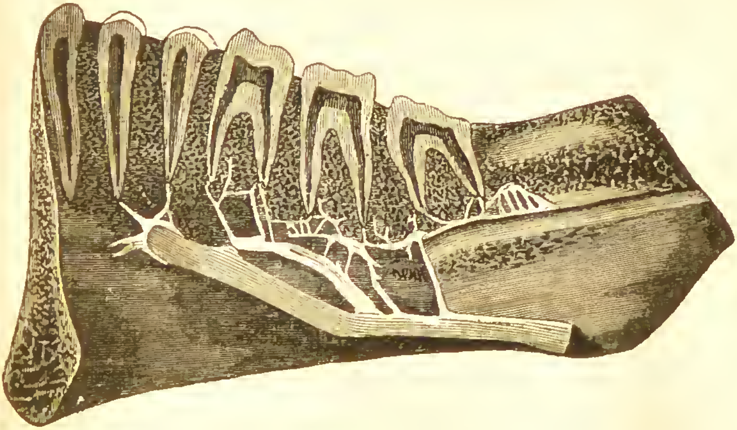
When the root of the tooth becomes completely absorbed, the crown falls from the gum, and in doing so uncovers the point of its successor, which is generally found occupying the position formerly held by the root of the primary tooth just shed.

It has generally been customary amongst dentists, to oppose the teeth being shed in the natural way; and with parents the notion has become very prevalent, that the primary teeth ought never to be allowed to fall out, but should be removed by a professional man. This custom is a very good one for the practitioner, but it is in other respects quite useless; indeed, it may be said to be worse than merely useless, for it is not only annoying to the child and expensive to the parent, but also frequently gives an unintelligent operator a chance of destroying the arch of the jaw, and deranging the whole secondary set by improper extraction of the primary. Many a man has been the cause of extensive evil by supposing himself wiser than nature.

The four front cutting teeth, one pair in the upper and one in the lower jaw, are generally shed about the age of seven; at about eight, the second pairs of cutting teeth are shed, and the permanent ones gradually protrude from the gums; at nine, the shedding of the first grinders may be expected; at ten, the second fall out; and about eleven or twelve years of age, the third cutting or eye teeth are shed, being the last of the twenty primaries.

The fourth pairs of grinding teeth may be expected to cut the gums about twelve or thirteen, and the fifth pairs, or wisdom teeth, between twenty and twenty-five years.

While these changes are taking place in the jaws, the bony substance of which the sockets are composed expands, and the jaws themselves elongate, so as to give the secondary set sufficient room. It will be recollected that at the commencement of the formation of the teeth, the sacs and the arteries which fed them, occupied the same cavity. As the jaw expands, however, the teeth become inserted in sockets above the cavity in which run the blood vessels, and these vessels communicate with the teeth through the small apertures at the bottom of the sockets. The following longitudinal section of part of the under jaw, shewing the teeth imbeded in their sockets and receiving their nerves, will tend to illustrate the manner in which they are nutrified and made vital.



Some writers on Dentistry have expressed the opinion that the teeth are inorganic substances, destitute of all living properties;

while others contend that they are like the other bones in respect to organization. This dispute might long since have been terminated, if the arguments advanced on the different sides of the question had been treated with a proper degree of scrutiny and respect by the disputants. The great objection advanced against the organization of the teeth is, that their bone is without vessels; and this assertion is made on account of our inability to inject any matter into the bony substance. Now, the fact of our not being able to inject a substance does not prove that it has no vessels, but only shows, that if there be vessels they are of too minute a nature to admit our injections; so that, this objection can have no weight, if there be anything like evidence in favour of the theory against which it has been advanced.

The presence of nerves and blood vessels in the bony substance of teeth is capable of the most satisfactory demonstration. In the majority of cases where teeth require stopping, and particularly where a large cavity has been formed, it is necessary to remove the decayed and diseased bone. The latter is generally found of a *red tinge*, and so excessively vital, that the slightest touch will excite in it the most excruciating torment. In many instances so excessive is the paroxysm occasioned by pressure on the inflamed bone of a tooth in eating, that the sufferer has been led to suppose the central cavity and pulp of the tooth exposed, whereas the disease was merely just beneath the enamel. It is often necessary to use chemical means to remove this excessive irritability, for the purpose of enabling the patient to bear the operation of stopping.

The presence of nerves is also demonstrable by filing the teeth. As soon as the file passes through the enamel, it, on coming in contact with the bony substance of the tooth, causes pain: this is a fact which unfortunately, owing to the general custom of filing teeth, is pretty well known to the public. Now, these pains must be caused by contact with nerves in the bony structure of the tooth, for if there were no nerves in the structure it would not be susceptible of pain. Whereever nerves are demonstrated to exist, there we may safely conclude are vessels also.

The very nature of the substance of the tooth shows the necessity for nutrition and change of particles, a principal part of the substance being animal matter, and liable to putrefaction if not kept under a process of continual change. To carry on this change there must be vessels in every atom of the bony substance or else the tooth would decompose.

In opposition to this Mr. Hunter gives the following experiment:—'Take a young animal, viz., a pig, and feed it with madder three or four weeks; then kill the animal, and upon examination you will find the following appearances:—first, if this animal had some parts of its teeth formed before the feeding with madder, those parts will be known by their remaining of their natural colour; but such parts of the teeth as were formed while the animal was taking the madder, will be found to be of a red colour. This shows that it is only those parts that were formed while the animal was taking the madder, that are dyed; for what were already formed will not be in the least tinged. This is different in all other bones, for we know that any part of a bone which is already formed, is capable of being dyed with madder, though not so fast as the part that is forming; therefore as we know that all other bones when formed are vascular, and are thence susceptible of the dye, we may readily suppose that the teeth are not vascular, because they are not susceptible of it after being once formed. But we shall carry this still farther; if you feed a pig with madder for some time, and then leave it off for a considerable time before you kill the animal, you will find the above appearance still subsisting, with this addition, that all the parts of the teeth which were formed after leaving off feeding with madder, will be white. Here, then, in some teeth we shall have white, then red, and then white again, and so we shall have the red and the white colours alternately through the whole tooth. This experiment shows that the tooth once tinged does not lose its colour; now, as all other bones that have been once tinged lose their colour in time, when the animal leaves off feeding with madder, (though very slowly) and as that dye must be taken into the constitution by the absorbents, it would seem that the teeth are without absorbents as well as other vessels.'

The conclusion of Mr. Hunter is by no means a fair one, for a similar mode of arguing would lead us to the conclusion, that the skin is not vascular, because the substance introduced in tatooing is not immediately absorbed. Some of this substance however is absorbed, for in a series of years the marks become paler. But, if so long a time be required to remove a portion of dye from the skin, so vascular a structure that the slightest puncture will cause it to bleed, how much longer time will be taken in removing the dye of madder from a dense bony structure like the teeth, whenever it is admitted that it is absorbed 'very slowly' from the bones. In experiments of this nature that I have tried, I have invariably found by comparison of teeth extracted from animals at different intervals that the dye does gradually fade.

But this mode of experimenting can lead to no satisfactory conclusion, owing to the length of time necessary to remove the madder.

The presence of absorbents in the teeth is proved by the absorption of the roots of the primary teeth, by disease and many other circumstances.

Mr. Bell uses the following language with respect to this question, amongst his other able remarks on the organization of the teeth:—"The question, however, does not rest on doubtful experiment. A case which occurred to me some years since, the preparation of which is now in the collection at Guy's Hospital, appears to me satisfactorily to prove the presence of absorbents in the teeth. It was, in fact, an instance of true abscess in the bone of a tooth. Inflammation had existed for a considerable time, and after extraction, on sawing the tooth through, for the purpose of ascertaining the state of the internal structure, I found a cavity formed in the very substance of the tooth, communicating with the natural cavity and filled with pus. Here then is a case in which suppuration had taken place as a consequence of severe inflammation, and the pressure of the pus occasioned absorption." This is a most satisfactory demonstration of the presence of absorbents in the bone of the teeth.

The presence of vessels in the teeth is also demonstrated in cases of violent death, such as hanging or drowning, in which instances the colouring particles of the blood are actually forced into the bone of the teeth in such quantity as to die it of a reddish colour. This could not take place if there were no vessels penetrating through the bone.

Another fact is, that in cases of jaundice the teeth are injected and dyed yellow; this colour is gradually removed from the bone, so that in course of time it assumes its whiteness again, which is another demonstration of the presence of absorbents.

The vitality of the teeth is a fact of so palpable a nature that it seems most wonderful that any one possessed of experience could doubt it. The bone of the teeth differs with the other bones of the body in nothing but density. They contain an internal pulp on which ramify blood vessels and nerves, and the internal cavity is lined by periosteum. The root is also covered by a periosteum, and to show the connection between it and the bony substance, teeth have been extracted and planted in the comb of a cock, to which they have always been found to adhere firmly. This adhesion is produced by the attachment of the vessels of the tooth, periosteum, and comb.

Most of these facts have been advanced before, yet still persons are found who deny the organization of the teeth, and books have been latterly written actually maintaining that they are inorganic. At the time when Mr. Hunter wrote, when scientific men first began to be attracted to an examination of this subject, it was not surprising that errors should arise; but, after so many new facts have been elicited and published to the world by their discoverers, it is most astonishing that persons can be found who, despite of all truth, will maintain that a substance possessed of sensation is not vital—that a substance capable of being injected is not vascular—that a substance in which absorption takes place is destitute of absorbents. The only way of accounting for the opinions of these writers is by supposing them to be imperfectly acquainted with the subject, and the complete want of information in their books, together with their not even noticing the facts which demonstrate the vascular nature of the teeth, is evidence of a weighty nature in favour of the supposition.

One of the principal arguments advanced

by physiologists in support of the theory of the frugivorous or fruit-eating nature of man, is derived from the similarity of the human teeth to those of the monkey. This similitude decidedly exists, and appears to warrant us to come to the conclusion, that man should live altogether on similar food.

There is a harmony of design discoverable in the different organs of the animal frame, and that sort of food which the teeth are designed to masticate, the stomach and other organs of assimilation are calculated to act on with most advantage. The different bones, muscles, joints, and also the desires attached to the brain and nerves, are all adapted in relationship to the ends to be fulfilled by the existence of the animal to which they belong. Acting on this known principle the geologist, when he finds a fossil bone imbedded in some portion of the earth's crust, brings to its examination the laws of comparative anatomy and soon is able to picture in his mind the shape of the animal to which it belonged; and, also, to infer from it the nature of the different organs of the creature's system, together with its instincts and habits. All this may be inferred from a single fossil tooth, or even part of one. The train of reasoning by which the conclusion is arrived at, is, when understood, so convincing as not to leave a doubt on the mind. Now, if in a remote future era the race of man should fade away from the face of the globe, and his position in the creation be occupied by another creature of equal intellectual dignity, the fossil osteologists of this new species (supposing it to advance in science as much as man has) would be forced to come to the conclusion, on examining fossil human teeth, that their owner was a frugivorous animal. The only objection that could be advanced would be, that human remains might be found in climates of such intense coldness as to be inadequate to the supply of vegetable food, and this is answered by the evidence of variation of climate. The fact of present human omnivorousness is not owing to the general organic nature of man but to the construction of his brain. By its highly intellectual character he is able to adapt himself to all climates, and find food almost every where. The horse, the sheep, the monkey, and many other animals of a frugivorous or herbivorous nature, have been by education taught to live upon flesh, and by the same means man, who is more peculiarly the creature of habit and training, may be educated to live on any description of food; he is strown over the whole surface of the globe; in countries of the most intense heat or in those of the most piercing cold, and while the force of education enables him to endure the intensity of the climate, the power of his mind aids him in adapting himself to the peculiarity of his circumstances. Animal food differs only from vegetable in containing the elements of nutrition in a more concentrated shape, and though the infant does manifest an instinctive desire for fruit, it can easily be trained to subsist on flesh, and the one appears from experience to be quite as wholesome as the other, although it may be admitted that the use of the former is more natural, and certainly, as some philosophers assert, far more moral and humane.

CHAPTER III.

Observations on the causes of dental disease—Malformations of the jaws and teeth—Irregularities of the teeth and jaws—Diseases of the teeth and socket bone—Injurious mechanical and chemical agents.

The human mind is so constituted that man universally believes that every change in nature is the effect of a cause. If this principle be true, every modification of structure, every motion, every combination of matter, and each of the phenomena exhibited in the mental and physical creations, are merely sequences in a chain of causation. The bodily and mental characteristics of any individual animal, are merely links in this chain of necessity, and are by this means affected by a power over which the affected individual has not had the slightest controul.

The lower classes of animals being led by their desires, are impelled to seek out those combinations of circumstances which are most in harmony with their nature; and by this means each quadruped, bird, or fish, and every member of the infinite insect creation, exults through a glorious existence, the brightness of which is unsullied by pain, save only in those instances wherein it appears to be introduced, like discords in music, for the purpose of making enjoyment greater; and the elements by which this happy life is supported, at its termination only change into a mass of new animated being.

With man the case is widely different, his natural instincts always being modified by education. By this power his opinions are impressed on his mind, and by it the intellectual and moral susceptibilities attached to the brain are developed. By education he is given the mental character of the Indian, the Tartar, the Arab, the Christian, the Mahometan, the Chinese, or the Hindoo. He may, in some instances, be possessed of an original organization of brain arising from unknown causes connected with its formation, which may give a force of character that will disqualify him from being acted on by one set of circumstances; but the removal of these only makes room for other motives of a more congenial nature to his peculiar temperament. His bodily characteristics, such as organic excellence, soundness of structure, his stature, size, shape and proportions, his health and strength, and all the corporeal circumstances, seem to be effected by a chain of causes which the individual by himself has no controul over, and of which the great mass of society knows little or nothing. If human nature were generally understood, how complete a moral change would the intelligence necessitate! —if man perceived the causes of health and happiness, and those of disease and misery, he must, from the nature of his mental constitution, seize upon the former; but this knowledge is not yet attained by the mass, causation is unknown to it, and the great majority is busily employed in acquiring and storing up diseases and misery, which are unwittingly perpetuated from parent to offspring.

The circumstances with which man is surrounded are not in harmony with his nature, neither are his present habits; until these circumstances are altered, and the habits disbanded, he must remain subject to the inroads of those terrific diseases to which he is at present so liable. Palefaced withering Consumption, Gout grinning with torture, trembling Palsy, parching Fever, raging hideous Insanity, melancholy-sickly Dyspepsia, nerve-tearing Ticdoloroux, and the paroxismal or continuous piercing agony of diseased Teeth, must continue to afflict the human race till it progresses to a high state of rationalism, when the causes of these, and all other diseases, being generally known, will of necessity be avoided.

The primary teeth, and the upper and lower third pairs of grinding teeth, may be considered as the parents of the rest; and these are, we have seen, formed in the fœtus while yet a tenant of the womb. They, of course, with the rest of the fœtal structure, are formed from the mother's blood, and if this be of a deteriorated nature, as it is almost certain to be under the present habits and circumstances of society, the teeth and all the other organs, but particularly the teeth, will contain the elements of disease interwoven with their inmost structure. Until man becomes a really religious being—until he understands and obeys the laws of the Creator—until he lives in harmony with the nature with which that Creator has endowed him, the dentistrical profession as well as the medical will have very numerous professors, many of whom will, no doubt, accumulate large fortunes by the afflictions of their fellow creatures!

If the parent's blood be of a deteriorated nature, the membrane covering the pulp which secretes the bone of the tooth, and the membrane of the investing sac which secretes the enamel, will not perform their functions so well as if formed from a healthy blood; neither will they be able to extract the elements of a durable bone, or of a hard, thick chrystalline enamel capable of bearing the action and friction of mastication, from a bad sanguineous fluid. To the moral and religious teacher, and not to the practicers of dentistry or medicine, however much they may aid by communicating their experience, belongs the task of removing this fundamental cause of disease, which exists in the blood, and is induced by the present moral arrangements of society.

From the cause above alluded to, arise malformations of the jaws and of the teeth; that of the jaws consists in an unnatural structure of the bone of the sockets, which confines the teeth in too small a compass, or else gives so redundant a one as to separate them from each other, and deprive them of their reciprocal support; that of the teeth is in a vitiated nature of their bone or enamel, or a wrong formation of their shape. Sometimes confusion of their position arises and often supernumeraries, from disease in the pulp, or deficiencies from a total want of it. In the former case (that of supernumeraries) the jaws will sometimes be crowded with strange formed teeth; in the latter the primarics (or some of them) will never be shed, but continue to occupy the place which ought to be occupied by the strong made permanent teeth.

If, when the teeth are protruding from the gum, and advancing towards their proper positions in the mouth, one of them should strike out of the regular arch, it immediately meets with a pressure which is calculated to propel it into its right situation. This pressure is given by the tongue, the inside of the cheeks or lips, or perhaps by antagonist teeth. Thus if one of the upper cutting teeth projects irregularly out of the arch formed by the rest, it is acted upon by the lips and pressed back towards its place; if one of the lower should do so, the contact with its antagonist would force it back. Suppose that instead of projecting they were to fall back into the mouth, immediately the tongue, stimulated by any irregularity, would be continually bearing against it, and thrusting it forwards. Similar circumstances checking irregularity are to be found in connexion with the grinding teeth. But when the jaw is not sufficiently comprehensive to permit a regular arch being formed—when the development of the socket bone has been by some cause restricted, then the powers provided by nature are inadequate, the tongue may press, and the lips and cheeks may press, but to no avail: the malformation must continue unless aid be had from art.

Sometimes one, or perhaps, all of the lower cutting teeth project so as to strike outside of the upper. This case is very common, yet scarcely anything can be imagined more at variance with nature, for on those parts intended for the action of cutting or grinding, the enamel is wisely deposited in a much thicker proportion than on those not intended for this purpose; as for instance—on the surfaces of grinding teeth—on the insides of the upper cutting teeth, and the outsides of the lower: on the other parts, not being designed for action, the enamel is much thinner. Now, when the lower cutting teeth project, their insides, where their enamel is thin, are in constant friction with the outsides of the upper, where theirs is also thin, while those parts where the enamel is thick, and calculated for action, are by this irregularity actually left entirely without use. The consequences of this malformation are untimely looseness of the cutting teeth, and a wearing through of the enamel, either of which leads to their destruction, and is generally accompanied by considerable pain.

Sometimes it happens that the alveolar process of the upper jaw will be contracted in its growth, so much that the arch which it forms will be so small that the teeth, and particularly the cutting teeth, must project considerably to be acted on properly by their antagonists in the lower jaw. This projection of the upper teeth not only deranges the contour of the face by pushing out the lip, but predisposes them to looseness.

Irregularity amongst the primary teeth seldom occurs, the circumstance which generally occasions it amongst the secondaries is the non-expansion of the jaw at the time of shedding, when additional space is required to make room for them, being larger in size and also more numerous than the primaries. The third cutting, or eye teeth, seem to be more liable to derangement in position than the others; for, being shed last, if the arch be still contracted, it will be impossible for them to attain their right situations, unless expansion takes place; but when this expansion does not occur the eye teeth are left at the outside of the arch, and thus destroy its symmetry.

Sometimes the cutting teeth, instead of

acting on the principle of the scissors, meet one another directly on their edges, and by this action they are liable from friction to be worn gradually away. There are physiologists, who have written upon this subject, who are of opinion that cases of this latter description cannot be considered unnatural, inasmuch as it is asserted, that there are whole peoples possessed of this kind of dental formation. We have a right to doubt this latter assertion till proof of the most positive nature be adduced in its favour. The mere statement of a traveller, that in a certain country the under teeth of the people, instead of striking inside of the upper, met them and acted against them edge to edge, is altogether insufficient. The mode of examination should be stated; for it must be admitted that merely looking in a person's face would not suffice; also the number of mouths examined, because, if half a dozen people seen by a traveller have their jaws formed in this manner, we are not to conclude that, therefore, their whole nation are in this respect similar; so that there is considerable incredibility attached to this mere assertion. The cases of this nature that have fallen under my observation have generally been hereditary, but at the same time most decidedly unnatural, always having a tendency to the destruction of the cutting teeth; for, not being adapted in such a manner as to permit their edges to act continually against each other with safety to themselves; first, their enamel is worn away from the edges by friction, then a portion of the bony structure; and the teeth, always having a tendency to be propelled from their sockets, gradually, as their tops are worn away, protrude so as to keep in contact with their antagonists, and thus continue to destroy each other. This deformity may easily be removed in youth, as shall be explained in the ensuing chapter.

Irregular positions of the teeth are so numerous and diversified that an enumeration or description of them would be impossible. Sometimes it happens that one or two of the upper cutting teeth will strike inside the lower, while all the rest retain their natural position; frequently does it occur that the lower teeth, instead of being placed side by side, are crowded together in confusion, some behind the others, and some too much in front.

Those teeth that are the offspring of the primary,—namely, the cutting ones, and the first and second pairs of grinders, which are very appropriately called the small grinders, are most liable to irregularity; indeed, the large grinding teeth are very seldom displaced owing to their being produced successively. The fourth pairs of grinding teeth are produced from the third pairs, and gradually, as they grow, the jaw lengthens so as to give them room. Long after they have taken up their position, the fifth pairs or wisdom teeth cut through the gums.

With the cutting teeth and small grinders the case is different; these crowd forward, in the course of the few years occupied in shedding, almost simultaneously. At this period it is absolutely necessary to watch the progress of the second dentition with the greatest care, so as to be enabled to perceive any derangement that may be taking place in time to remedy it.

Instances are by no means rare of the non-shedding of some of the primary teeth, occasioned by a deficiency of secondaries, which deficiency is sometimes hereditary; but more generally traceable either to violent accidents, or the improper mode that has been adopted of lancing the infant gums in teething. The regular practitioner frequently meets with cases of this description, wherein some of the small sized primary teeth retain their position, no secondary being beneath them. When inquiries are made of one of this class of patients, it is generally found that a violent blow on the mouth, from a fall or some other cause, had been received in infancy, which had the effect of crushing the socket bone, and temporarily loosening several of the primary teeth. A cause of this kind is adequate to the complete destruction of several of the pulps of the secondaries, and, where such a statement is made by a patient, the dentist is warranted in attributing the effect to it, in case of the absence of contrary evidence.

In the general organization the child is most frequently found to bear a strong resemblance to its parents; but, in no class of organs is this likeness so striking as in those of mastication. A total deficiency with respect to certain teeth, or a malformation of some tooth, has been observed in the same family through several successive generations.

When the infant is possessed of a hereditary contracted jaw, the same derangement effected in the parent must be produced in the child, unless artificial means be taken to prevent it.

In the previous chapter it was said that the primary sacs give out buds, which gradually expanding become the instruments by which are formed the succeeding secondary teeth. Now it often occurs that instead of one bud shooting out from a sac a pair will spring out, and each of these producing a sac, from which emanates a tooth, two teeth are formed where only one should be; one of these, of course, is supernumerary. The supernumeraries are generally much smaller than the others; but, nevertheless, they occasion considerable irregularity and annoyance by displacing the regular teeth, or galling the tongue in its action. They are most frequently possessed of a spiked form, and situated on the palate just inside of the dental arch. In this position they are highly injurious, not only in tending to prevent distinct vocal articulation, but, also, often in creating irritation and sores of a very serious nature on the tongue. The fact that the irritation occasioned by these supernumeraries has caused cancerous affections of the tongue, is sufficient, if known, to make those persons in possession of these abortions, have them removed as speedily as possible.

The enamel is often deposited in a very imperfect manner, sometimes having an undulated appearance, as if the investing sac, from which it was secreted, had been crumpled in wave-like forms while performing its function. Sometimes a transverse stripe of the bony surface of the crowns of the upper cutting teeth, nearly the eighth of an inch broad, is left uncovered with enamel; and at others, the enamel is full of holes in which secretions of a dark colour being deposited, altogether destroy the good appearance of the teeth, and very much predispose them to decay.

In the course of the formation of the bony structure in the sac, it has sometimes occurred that two sacs being pressed close together have had that part of their sides absorbed which came in contact, and thus the bony matter deposited from the pulps, becomes so closely connected as to have all the appearance of being one substance, and the two teeth produced are in a state of osseous union. Instances of this nature are really very uncommon, though practitioners, who are in the habit of extracting a couple of teeth together, are often found ready to offer as an excuse for their mismanagement or misfortune the tale, that the teeth were in a state of bony union previous to extraction, and were separated by the force required in the removal of one.

When the roots of teeth are really united there must be very considerable difficulty connected with their extraction, and it is a most fortunate occurrence that cases of this nature are rarely met with; the specimens of the bony union of teeth are few and highly prized by their possessors, they are sometimes to be found in the museums of the Medical Schools or Hospitals.

The evils effected in the structure of the dental bones by a deteriorated state of the fluids, has been before adverted to. Mr. Fox says, that 'Decay of the teeth is often the consequence of certain states of the constitution, in which the functions of the body are performed irregularly, inducing various dyspeptic symptoms.' And, perhaps, he might, without violation of truth, have said, that decay is generally effected in this manner. What appears to me to be the state alluded to, is a congestion of the blood in the sanguineous channels of the ultimate tissues. In the first chapter an outline of the circulation of the blood was given, and the reader will probably recollect that it is propelled from the heart through the arteries, and that these subdivide till at length they assume a minute hair-like form; when they reflect back upon themselves and become veins. A piece of red flesh, or lean, is nothing more than a mass of these minute ultimate tubes of the arteries and veins interwoven with nervous threads, and bound in the cellular substance, so that the flesh may be considered as a woven mass of the ultimate tissues. Now, if the blood be not forced through the system with a healthy degree of energy, if the circulation, instead of being carried on with its natural degree of rapidity, is allowed to pass through its channels sluggishly, as is the case unfortunately with people of inactive habits, the sanguineous fluid will have lost most of its vital quality before it has passed the arterial tissue, and that bad portion of the fluid which should be thrown off from the system in perspiration and exhalation, by the stimulus of violent exercise, remains; thus deteriorating the nature and increasing the quantity of the fluid in the ultimate tissues. It is in these tissues that the juices of the body, such as the saliva and the bile, are extracted from the blood; and if this be of bad quality, of course the juices formed from it must be so also. Hence arises a general derangement in the functions; the digestive processes are directly impaired in consequence of the vitiated nature of the digestive juices, and this state seems to induce active disease in the bone of the teeth more speedily than in any of the other organs.

Those branches of the human family that. employ their time in continuous exhilirating exercises, are free from disease in the bone of their teeth, whilst the members of what is called civilized society, who are employed in the monotonous and insipid operations of mechanism, or else languish away their time in luxurious idleness, are seldom without it. Whether primaries or secondaries, the evil consequences of unnatural habits will soon be demonstrated; for, it seldom happens under our constitution of society, that children shed their primary teeth previous to their having caused pain from decay, and the secondaries generally exhibit disease before the age of twenty-four. The deteriorated nature of the fluids may be considered as the predisposing cause; the accessary causes are transitions in the mouth from heat to cold, or cold to heat, created by the sudden presentation of food in too hot or too cold a state, or by breathing through the mouth instead of the nostrils. These transitions are adequate to effect the disruption of the enamel, and the flaws in it must be speedily penetrated by particles of food which soon decompose. The surface of the bone may be thus acted on injuriously by a chemical agent, and from the same source that its exposure is brought about, the whole bony structure of the crown of the tooth must be seriously affected. Removal of the enamel by accidental splintering, or (as is frequently the case) by the operator's file, leaves the bone without its natural protection; but these, though most frequently highly injurious occurrences, do not generally form depositories for putrid matter to lodge in, and hence they sometimes take place with impunity.

The bone, when predisposed by the former cause, and excited by the putrid matter, inflames in the part immediately beneath the injured enamel, and mortification ensues; this disease has very properly been termed gangrene. The inflammation, if not arrested, advances through the bone towards the central canal, and a cavity is created which is ultimately exposed by the breaking in of the enamel. Thus what is called a hollow tooth is formed, and this hollow, being gradually enlarged, eventually communicates with the central cavity. When this circumstance takes place an attack of toothach may be anticipated; indeed, pain is often experienced before this period during the progress of the gangrene, and is frequently induced by the pressure of an extraneous substance in the earliest stage of inflammation.

In instances where the gangrene spreads superficially, as it sometimes does on the sides of the large grinding teeth, and the enamel breaks in, exposing a hollow of slight depth; it now and then occurs that the progress of the disease is stayed, particularly when the adjoining tooth has been removed. This seems to arise from the cavity being inadequate to hold matter, and from its being washed by the saliva and cleansed by friction of the tongue. If the gangrene be not arrested, it mostly removes the whole crown; and the internal pulp with its blood vessels and nerve being destroyed, the remaining portion of the bone, forming the root or roots, loses its vitality, and is, of course, no longer the subject of disease. It remains for some time in the socket an extraneous irritating substance; but is gradually loosened, and ultimately expelled, either by the absorption of the socket bone surrounding it, or by the socket itself becoming filled by a deposition of fresh ossific matter. By either of these circumstances taking place, the root may be removed from the mouth, or else laid prostrate on the surface of the gum, where it will still be a source of considerable annoyance.

The internal pulp containing the nerve and vessels, and also its investing membrane from which the bone of the tooth was secreted, are also (if the predisposing sanguineous state exists) susceptible of inflammation from sudden transition of temperature in the mouth. Where a cavity exists in the bone, allowing the atmosphere to communicate with the membrane of the pulp, the exposure, of course, creates a much greater liability to inflammation than exists when the bone has not been attacked and excavated by gangrene. For this reason, though inflammation of the pulp sometimes takes place without the bone being gangrened in the slightest degree, yet in a very great majority of instances its occurrence is subsequent to the exposure resulting from the excavations made in the structure of the crown by gangrene. The swelling induced in the pulp by inflammation is resisted by the walls of the cavity containing it, and thus intense pressure must exist in the tissues of the pulp, and of course the nervous fibres come in for their share of this intense pressure—thus toothach is excited.

When the inflammation is violent mortification follows, and the pulp is completely destroyed; but, if it be not very violent, a gradual abatement of the disease may take place. If the pulp be destroyed, the bone of the tooth is left without an adequate supply of blood, and, consequently, it soon becomes a dead substance, loses its natural colour, assumes a much darker shade, and gradually gets loose.

The membrane with which the socket is lined is attached to the roots of the teeth, over which is spread a thin web, supposed to be a reflection of this socket membrane. A cold in the face affecting the gums often spreads to these membranes, causes inflammation and swelling in them, and thus raises a tooth in its socket so much as to elevate its surface above the surfaces of the adjoining teeth, and bring it into contact with its antagonist before its neighbours meet their opponents. This occasions much soreness about the tooth in closing the mouth, and often leads to the formation of a permanent disease in the membrane, it becoming thickened and bushy and continuously painful.

The root of a tooth is sometimes found covered with a quantity of horny matter the colour of amber, this seems to be a deposition from the membrane investing the root: from its pressure on the sides of the cell of the tooth, absorption in the socket bone takes place, and from the irritation of the membranes, a slight but continual pain is kept up. This disease is found in the other bones of the body and is termed exostosis; it apparently arises from disease of the membrane from which the matter is secreted.

The saliva at all times holds lime and animal matter in solution; but, when the fluids become deranged, it appears either to have a redundancy of these ingredients, or else to lose its capacity of holding them in solution; for, in such circumstances, a deposition of phosphate of lime containing animal matter, is continually incrusting itself about the teeth. This matter, known by the name of tartar, is generally formed at first at the insides of the lower cutting teeth, and the outsides of the third, fourth, and fifth pairs of grinders, and it gradually accumulates round their necks, and by irritating the gum and alveolar process, or socket bone, induces in them inflammation and absorption. By these means tartar always has a tendency ultimately, though slowly, to effect the removal of all the teeth in the jaws. The socket bone is exceedingly liable to absorption, and if an exciting cause be presented, such as the presence of tartar, inflammation begins in it, and is kept up by the irritating mass until it becomes chronic. The pressure occasioned in the bone by its inflamed state, leads to a gradual absorption, and the teeth are eventually left without sockets when, of course, they fall out from the gum.

This disease of absorption in the sockets is often excited by the use of mercury as a medicine, and nothing else in the shape of dental disease is so much to be dreaded, gangrene destroys the teeth one at a time, absorption of the sockets simultaneously aims at the destruction of the whole set. Absorption of the sockets is commonly known by the name of 'scurvy of the gums;' it is not incidental to youth; but, very few people in England attain the age of forty without their gums, by retiring and leaving the necks of the teeth exposed, indicating the progress of absorption in the socket bone.

The dental diseases, the progress of which has been described, are of an ordinary nature to be met with by the practitioner daily; but, there are affections of the teeth of a much more rare description, the causes of which may be said to be unknown. Sometimes it happens that teeth will gradually dissolve away, commencing at the top of the crown and continuing to do so till nothing but the root is left. This affection will form a groove along the edges of the cutting teeth, so that they will no longer be able to come in contact; and, in its progress, the centre of the bony structure is penetrated to, and exposed; but, strange to say, the pulp recedes, and the internal cavity is always kept stopped at the top by a horny secretion, somewhat analogous to the matter deposited on the roots in exostosis. Sometimes the groove appears near the necks of the teeth, passing in a horizontal line from one tooth to another, and having the appearance of being cut by a file.

A case of actual abscess in the bony structure of a tooth has been recorded by Mr. Bell, and as it is of a highly interesting nature, inasmuch as it at once demonstrates the vitality of the teeth, I have taken the liberty to quote the account of the case. "Mr. S., a medical gentlemen, had long been suffering extreme pain in the right side of the jaw, apparently produced by the second molar tooth, which, however, had no external marks of disease. After a time inflammation took place in the periosteum of the root, and the tooth was in a measure loosened. As it now became evident that the cause of the pain, which still continued to the most excruciating degree, was produced by this tooth, it was extracted; and, as no diseased appearance was found on its surface, I sawed it asunder at the crown, and found a cavity in the solid bony structure perfectly circumscribed; the surrounding bone being white, and of a healthy and sound texture. Not the slightest appearance of disease existed in any other part of the tooth, excepting that from the inflammation which had so long existed, the membrane had also begun to suppurate. In this case, then, it appears that inflammation had occurred from some local cause in the bone of the tooth; that the vessels of the bone had formed pus; and that absorption had taken place in consequence of its pressure, and had formed a cavity for its reception."

The teeth and gums are liable to serious injury from mechanical violence. Besides the various accidents, such as heavy falls and heavy blows, that we may have our dental organs shaken with, during our terrestrial peregrinations, there are mechanical agents, such as coarse tooth powders, incessant brushing, and badly constructed artificial teeth, which are highly conducive to their destruction. In addition to these there is one evil which must not be forgotten,—namely, the use of acid preparations for washing the teeth. These have been prepared by druggists and dentists, and by their recommendation used by deluded people, who vainly imagined when they were paying an exorbitant price for the poison, that it would make their teeth permanently beautiful and white. The consequences of the use of an acid are, that the enamel assumes for a short time a whiter semblance than usual, and ultimately turns brown, appearing to have changed into a soft chalk, which is soon removed, and the bone being thus exposed violent pains commence, which seldom terminate till the tooth is extracted or its vitality destroyed.

It has lately been asserted by some writers, that the black discolouration of the enamel is occasioned by animalcules, and that these can be removed by the use of ascetic acid. Now the existence of these animalcules has never been satisfactorily proved; but the destructiveness of the acid has, and any one who doubts it may convince himself by placing a tooth in it for a short time; so that it will be much safer to let the acid alone. As for the discolouring matter, whether it be organic or not, it can, with the utmost facility, be removed by means of a steel instrument, without injury to the enamel, and for the latter reason this mode is decidedly preferable to the use of an acid.

Any of the diseases of the masticating organs has a tendency to prevent the functions of assimilation being properly performed, and also to create pain of the most intense and harassing description. Hence arises the utility of the science which examines the nature of these organs, the causes of the various affections to which they are liable, and, also, the arts which are calculated to yield remedies, or restore them when lost.

The whole organization suffers by affections of these organs, and in some instances their disease leads to fatal results. The cavity in the upper jaw, just above the roots of the teeth, called the antrum, has had excited in it, by bad teeth or old roots, diseases of the most hideous and appalling nature, in which huge tumours have been formed, and excruciating agony and ultimate death occasioned. At other times nervous affections of the most tormenting description, in different parts of the body, have been induced by diseased teeth; but the description of these belongs properly to the general pathologist. And, although some eminent members of the profession seem to think that Dentistry should embrace these subjects, yet, still, the fact is, that no one would think of applying to the dentist in cases of this fearful nature.

CHAPTER IV.

Introductory remarks on the art of Dentistry—Treatment of the primary teeth—Treatment of the irregularities of the secondaries—Treatment of the diseases of secondary teeth.

THE original causes of disease must, from what has been said, appear to the reader to be of a moral nature: they exist in the institutions and habits of a people, and these being established by custom, the general will is favourable to them; this being the case, the individuals in the mass suffer from causes over which they have no control, and of which in the great majority of instances they know nothing. By this power the physician suffers in common with the rest of society. In vain, then, does the empiric pompously boast of his drugs being able to prevent the attacks of disease, the causes of which existing by the national will, can only be removed by that power.

If any one expects Dentistry to prevent the attacks of disease on the teeth he may, by a slight degree of reflection, demonstrate to himself that his expectations are utterly erroneous; for it only prescribes remedies for disease, makes known the predisposing cause existing by necessity, and cautions us against the immediate causes.

There are three circumstances necessary to enable persons to take proper care of their teeth; the will, the knowledge, and the pecuniary means, and if in possession of these, the dental pains, which are so general, may be much decreased, and when the masticating organs are removed, artificial substitutes placed in their stead. Irregularities can be removed; gangrene, if taken in time, may be arrested, and thus pain prevented, and toothache, if it should break out, at once stopped by the instantaneous extraction of the tooth, the place of which may be filled up by one of an indecomposable nature—one which in several respects is superior, and in some inferior, to the original.

If one of the parents of a child be possessed of dental irregularity, a similar formation may reasonably be anticipated in the offspring; but, whether the parents be so or not, they should from time to time examine their children's teeth, for the purpose of discovering if any injurious change be taking place. The primary teeth are exceedingly liable to gangrene, and if violent pain commences in them, it will often necessitate the removal of the diseased tooth, which operation may prove highly detrimental or even destructive to the secondary one which ought to succeed it; and may lead, by the permanent absence of one of the set, to an irregularly formed dental arch. For the purpose of avoiding this dilemma, in which the child is obliged either to endure a most excruciating torture, or a severe and injurious operation, the mother of a family ought to be capacitated to treat gangrene rationally, and arrest it in its incipient state. To do this and other little operations, all the mechanical implements necessary are, a couple of scaling instruments, an instrument for drilling into the cavity of a diseased tooth, an instrument for excavating the cavity and removing the diseased bone, and one or two stopping instruments. The ingredients used for stopping or plugging the holes in decayed teeth, are, gold of the finest quality, rolled into a thin leaf, so as to be as easily pressed together as soft blotting paper; next to this is platina leaf, which answers the purpose of gold and is much cheaper. Tin foil has been used extensively for stopping teeth; but, there is an objection to it; on account of its discolouring. In cases where a large cavity is excavated, and the gold will not suit as a succedaneum, other materials must be had; something in the shape of a paste is required. I have in cases of this kind, for many years, used an amalgam of silver, prepared in the following manner, and though there are objections against it, still, until something better is laid before the public, it will be found of a highly useful nature. The ingredients necessary for the cement are, silver filings, thinest silver leaf (to be had in small books) and quicksilver. A drop of quicksilver is poured out from the bottle into a small mortar, or, if more convenient, on a cloth; on this is placed a leaf of silver from the book, which, being worked into the quicksilver, becomes speedily amalgamated with it, another leaf is then added, and so on till the amalgam is a thick paste; if there be too little quicksilver in this amalgam, the want will be made perceptible by its non-adhesion, and, on being worked between the fingers, by its crumbling. If, on the contrary, it possesses too much mercury, it will be too soft, and the mercury may easily be squeezed out.

When the amalgam is brought to a proper consistency, having just sufficient mercury to enable it to be used as a paste, a small quantity of silver filings should be mixed with it: these absorb a portion of the quicksilver, and hence there is insufficient mercury left to keep the silver in a soft state: thus, after the filings are introduced, the amalgam gradually hardens. Here, then, we are in possession of a cement which may be used in a soft cold state; yet, on being placed in the tooth, speedily hardens in the cavity. This cement is decidedly superior to those so much advertised, one of which I found, on examination, to be plaster of paris, another that I have seen is the Roman cement used in building;

but neither of these answers, and persons who have been led to try them by advertisements, in which they are called ‘silicious pearl,’ or some such extraordinary name, very soon find that they have been the dupes of quackery. An amalgam of quicksilver and lead, fusible at a very slight heat, has been used more than forty years for plugging teeth: from its very fusible nature it is termed the fusible metal. Latterly this ingredient has been more used than ever, though under different names, such as ‘anodyne cement,’ ‘mineral succedaneum,’ ‘pearly enamel,’ &c. This substance, though often ostensibly applied in a cool state, must really be, when used, possessed of about the heat of boiling water, and as it cools, the caloric, of course, goes out and the substance contracts, leaving an aperture between it and the walls of the cavity sufficient to permit the saliva to penetrate. For this reason it cannot be of the slightest utility as a cement, and, so far from being of a pearly enamel nature, it grows as black as coal in the course of a few days after its introduction to the mouth and contact with the saliva.

The succedaneums, then, that may be used with most advantage are gold or platina leaf, and the silver amalgam with filings. Various waxes have been tried unsuccessfully, not being able to resist the solvent action of the saliva, and being placed in the cavity in a hot liquid state, the heat acts most injuriously on the bone of the tooth.

When a dark discolouration is discernable under the enamel of a tooth, gangrene is there, and requires extirpation. To do this the broach or drill is used; its point being placed immediately on the enamel which is over the decayed bone, and the handle being rolled backwards and forwards between the thumb and fingers, a drilling action takes place, which gradually propels the point of the instrument through the enamel into the cavity. When the cavity is thus exposed, the discoloured bone must be removed from it; now, it often happens that this is an operation of a painful nature, owing to the irritable state of the inflamed bone; to sooth this the application of laudanum is often found useful, a small atom of lint saturated with it may be introduced to the cavity a short time previous to the excavation being commenced. When the bone has been found irritable, and the irritability removed by this treatment, the excavating instrument is taken in hand, and with it all the decayed and inflamed bone cut away, which, owing to its softness is easily accomplished. When the cavity is clear from all discolouring particles, and its walls of white bone are discernable, it being carefully dried with lint, the gold leaf is introduced, and pressed in firmly with the plugging instrument, until the whole cavity is filled solidly with gold; the burnishing instrument is then taken and the exposed portion of the gold well burnished.

If the gangrene have proceeded so far that a great part of the crown of the tooth is destroyed, and there is no holding for a gold stopping, the amalgam presents itself as an excellent substitute. This is placed in the tooth with much more facility than the gold; when the cavity is excavated and dried, it may be pressed in and burnished in half a minute, without causing the slightest pain to the patient.

When the gangrene has penetrated to the

central cavity of a tooth, and thereby exposed the pulp, the case is deemed by most dentists as altogether hopeless; but even these cases may, with a little care, be treated effectually. In removing the discoloured bone the central cavity must be carefully avoided, and over the exposed part of the pulp a piece of bee's wax may be placed, moulded with a concavity, so as to fit over the pulp like a lid, not pressing upon it, or even touching it any where; on this lid or bridge the amalgam can be laid without coming in contact with the pulp, and if the operation be neatly and carefully performed, the tooth may be preserved for several years.

The primary teeth ought to be paid particular attention to, and every thing that has a tendency to injure them removed. When any calculus or discolouring matter attaches itself to them, the scaling instrument and tooth-brush should be used. The calculus is deposited about the necks of the teeth, and may very easily be taken away by working the point of the instrument between it and the enamel: by this process the calculus is removed in scales, and the enamel not at all injured, it being much harder in its texture than a properly tempered scaling instrument, and therefore not liable to be scratched by it.

The fashionable portion of the community seem to hold it as a principle, that noisy activity amongst children is exceedingly vulgar and censurable; the more serious, look upon it as immoral and irreligious; and thus, one class of children is brought up in habits of unhealthy indolence, and the other of morbid gravity or moroseness. Young persons brought up in these modes of morality, will always, on rising in the morning, find their teeth covered with excretions, to remove which a tooth-brush and often powder is found necessary, and similar habits being continued during life, the brushing of teeth every morning is considered quite natural. In the circumstances every one must admit it to be a very proper operation, and highly conducive to the comforts of the individual; provided it be done judiciously. The brush and water is sufficient in the great majority of instances to remove the depositions; but, when it is not so, a little tooth powder may be used.

How often do we hear of preservative tooth powders calculated to prevent decay in the teeth: any such title ought to be sufficient to hinder a person understanding the subject from having anything to do with the powder; for, where the title contains an untruth, neither the manufacturer's honesty, nor the qualities of the articles produced by him, are to be trusted. The same cause that necessitates the use of tooth powder or brush, namely, the vitiated state of the fluids, necessitates inflammation in the bone, and it generally occurs, that those who are obliged, from the quantity of matter deposited on their teeth, to use the brush constantly, are most liable to the attacks of gangrene. The utility of the brush is in the removal of matter by it, which would, if left, accumulate and harden into calculus, irritating and exciting in the socket bone inflammation and consequent absorption. Cleanliness alone would, with most people, be found a sufficient reason for the removal of extraneous matter from the mouth.

One of the most unobjectionable tooth powders I know of, is prepared chalk: nothing possessing mechanical or chemical qualities of an injurious nature to the enamel should be used; and for these reasons coarse powders, or acid ones, ought to be carefully avoided.

In using the brush every part of the crown of the tooth should be cleansed; some people only brush the visible parts of the front teeth, and thus an accumulation of calculus takes place about the necks of the grinders, and at the backs of the lower cutting teeth. It is only by the general application of the brush that this can be avoided: insides as well as outsides, grinding surfaces, and interstices, should all be cleansed: to do this the motions of the brush must be perpendicular as well as horizontal. But despite of all the brushing, persons of very sedentary habits will often have a very disagreeable fetor arising from their teeth; this can only be removed by habitual violent exercise, or gentle exercise with vegetable diet.

At the time of shedding the teeth the child's jaws demand considerable attention; for this is the proper period to remedy irregularity. When the secondary under cutting teeth strike outside of their antagonists, application should be immediately made to a dentist, who will rectify the defect speedily. He, in the first place, takes a wax mould of the child's lower jaw, and then from this mould prepares a plaster-of-paris cast; this is sent to the iron or brass moulders, and cast in one of those metals. The dentist is thus in possession of a metallic casting which is an exact model of the child's under jaw and teeth. A cake of lead is melted in a ladle, and that portion of the metal cast which represents the teeth and gums is imbedded in the liquid lead, which is then cooled. The cast is used as a stamp, and the lead cake as its bed, and a piece of thin sheet silver or gold being laid over this bed, and the stamp hammered down into it, of course the sheet metal assumes the form of the cast, and fits it air tight. That portion of the silver plate that would press on the gums is taken away, and a silver cap, fitting on all the lower cutting teeth, and perhaps on some of the grinders, is thus formed. On this a piece of silver about the thickness of a sixpence is soldered, in such a manner as to cause pressure on the upper teeth in the direction which it is desirable they should be propelled in. The use of this instrument night and day will soon, by the pressure of the lower jaw against the upper, alter the position of the teeth, and by this simple process the most destorting and, to the teeth, the destructive malformation, —namely, prominence of the under cutting teeth,—can in youth be regulated with facility, as also may be many irregularities in the upper jaw.

In some cases the instrument described will not suit, and in these the bar is used. This is an instrument by means of which very considerable pressure may be caused on any tooth in the mouth, and in any given direction.

When the arch of the jaw is not sufficiently expanded to yield room for the proper formation of the dental arch, the wearing of regulating instruments is totally useless, and, indeed, if the irregular teeth could be propelled into the arch others would be thrust out of their places. In such circumstances as this it is customary with dentists to make each of the teeth a size narrower by passing a file between them. By this mode of treatment whole sets of excellent teeth have been destroyed, as it generally occurrs that gangrene speedily shows itself after the removal of the enamel from the sides of the teeth. Some dentists may say, that they do not remove the whole of the enamel from the sides; but this is perfectly ridiculous, for how are they to know? The enamel in these parts is thin, and when filing between teeth, the parts not being exposed to sight, the operator cannot know whether some portion of the enamel has not been penetrated through.

It may be set down as a principle in operative Dentistry that the natural defence of the bony structure of the tooth, the enamel, ought carefully to be defended against every kind of injury, and a file, or any thing else that wears it thin, or, by friction, creates sudden heat in it, ought never to be used.

It very frequently happens, that the secondary cutting teeth, on coming through the gum, crowd together irregularly; but, afterwards, the jaw gradually expanding, they are forced into their proper places by the pressure of the tongue, lips, and cheeks. Care should therefore be taken not to act too precipitately; but, on the contrary, to give nature as much time as possible consistently with the success of the *dernier* resort of extraction, supposing the probability of its occurrence.

If, from hereditary predisposition or other causes, the arch of the socket bones is insufficient to permit the teeth assuming their proper positions, the only way in which the defect can be remedied is by decreasing their number. Room may thus be made to allow the rest to be propelled into their places. If the cutting teeth have not space enough in the upper or under jaw, the extraction of the first pair of grinders will be found adequate to permit the adjustment. The reason why I recommend the pair to be extracted is this, that if only one be removed, the cutting teeth adjoining the space left will shift gradually till the eye tooth comes in contact with the second grinder, which advances from its original position.

The place of the extracted first grinding tooth thus becomes filled up by the closing of the adjoining teeth; now, if this dental movement takes place at one side of a jaw, and no corresponding one takes place at the other side, irregularity is created: the interstice between the front teeth, instead of being exactly in the front of the mouth, is slightly aside, and the whole set is thus awry. But if, on the contrary, the *two* first grinders be removed, a corresponding movement takes place at each side, and of course no consequent irregularity need be apprehended.

The greater number of cases of contraction in the socket bone, that have come under my inspection, have been the results of the too early extraction of primary teeth. When these are taken out, as they often are, previous to their successors being ready to take their places, the jaw becomes contracted, or else does not enlarge itself so as to admit of the secondary set taking up their position.

The plan of nature appears to be, to retain in the mouth the primary teeth until the secondaries are ready to protrude; by the advance of the latter the former have their fangs gradually absorbed, and ultimately their crowns thrust from the gum, and the top of the crowns of their successors exposed. In this arrangement we perceive that the primaries are retained as long as possible, and that the jaws are enlarged by the presence of two sets of teeth in them at the same time, the primary and the secondary.

These facts warrant the conclusion that the extraction of children's teeth when they become a little loose is unnatural and injurious in its tendency. The only instances wherein the extraction of the primaries is necessary, are—in the first place, in cases of pain; secondly, where their extreme looseness irritates the gums and causes gum boils; thirdly, whenever a secondary tooth makes its appearance near the primary one, the place of which it ought to occupy. In the latter case the primary tooth ought to be immediately removed and the secondary allowed to take up its proper position.

The desire evinced by parents to have their children's primary teeth extracted, in what they call 'proper time,' is excited by the belief that in so doing they are adopting the means whereby the dental health and dental beauty of their offspring is secured; this erroneous notion has been carefully impressed upon the public by the practisers of Dentistry, acting in obedience to what appeared to them to be their own interests. I do not mean to insinuate that the practisers of Dentistry have been any worse than the rest of mankind; my wish is merely to show that they are no better; and it appears to me as plain an ethical truth as any, that as long as parents are willing to pay fees to surgeons or dentists to have the natural process of the development of the jaws, and the shedding of the teeth, interrupted by the disruption of the primary teeth from their sockets—so long will be found practitioners not only ready to do the work, but, also, industrious in preaching up the erroneous opinion that the operation is beneficial and absolutely necessary.

It has been intimated above, that if the first pair of upper permanent cutting teeth made their appearance behind the first upper pair of primary cutting teeth, the latter, though not loose, must be extracted to allow the former to take up their proper position; so far the operation is remedial, but with few operators will this suffice. They seem to forget that the jaws become enlarged, and supposing that the large pair of secondary front teeth will not have room in the space occupied by the small sized primaries, they, to make room, extract the second pair of primary cutting teeth. When the large successors of these come there is a deficiency of room for them, and the primary eye teeth are extracted.

The secondary eye teeth come after the secondary small grinders, so that ere the eye teeth have advanced into their positions their places become occupied partly by the second pair of cutting teeth, partly by the first pair of grinders; and the spaces that ought to be filled by the eye teeth are thus closed up; and when the eye teeth do come through the gum, the dental arch being already formed, there is no room for them in it; they are, therefore, sometimes left at the inside, and sometimes at the outside of the place which they ought to occupy. Their presence in these circumstances is inconvenient and distorting, and their removal is deemed proper by the practitioner—hence arises another operation.

All this might be avoided, and a better set of teeth insured, by simply permitting nature to take its course; allow the secondary teeth to come gradually forwards, permit the primaries to remain till shed, do not officiously interfere with the progress of nature; for be it recollected, that the art of Dentistry ought only to interfere with the diseases, irregularities, and deficiences of the teeth, all of which are strictly unnatural. If parents observe anything of this kind taking place in a child's mouth, they are justified in interfering; but, where all is going on naturally, they ought by no means to offer any interruption whatsoever.

Supernumerary teeth should always be extracted; but after the operation care must be taken of the teeth adjoining, as the supernumeraries generally are fixed close to the socket of some regular tooth, which may move out of place from a cavity being made at its side. The presence of supernumeraries is generally disfiguring, annoying to the tongue, or injurious to the proper set, and for these reasons their removal is required.

Supposing, that by the treatment recommended, a regular set of teeth be secured; still they are liable to a number of other affections of a destructive tendency. With the majority of persons, but few years elapse after the evolvement of the secondary set before the appearance of gangrene, and if the mouth be not kept clean by the daily use of a brush, the teeth will be covered with calculus and other discolouring matter.

The effectual treatment of gangrene depends entirely upon its situation, and the shape of the cavity formed by the disease. If the decay appears in the interstice between two teeth, as it frequently does, and the excavation be merely superficially extensive, forming no holding for plugging materials of any description, it is clear that no stopping can be of any utility; and equally so that, if the disease be allowed to proceed, the rapid destruction of the gangrened teeth may, in all probability, be expected. In these desperate cases, resort is made to a desperate remedy, a file is taken and the whole of the decayed bone filed off. Sometimes this operation proves beneficial, but as far as I have been able to observe, more often entirely useless. The conditions which its advocates lay down, as necessary for the attainment of success, are, that the disease be perfectly extirpated by the file, and that the flat surface of the exposed bone be made as smooth as possible, and guarded against sudden transitions of temperature. Though it is not right to encourage a patient to expect positive success from this operation, still, it may safely be said that, in the circumstances, it is the only plan of treatment from which there is a likelihood of benefit; and therefore the experiment (if it be not painful) may be tried.

Cases of this description are the only ones that appear to me to warrant the use of a file to the teeth; and if this instrument had never been employed on the teeth for any other purpose, the total destruction of innumerable sets, that has resulted from the general use of the file, would not have been occasioned. Sometimes it happens that the gangrene at the interstices, excavates a globular cavity between two teeth. Such a cavity as this may be stopped up with the amalgam, and even with gold, if care be taken to perform the operation judiciously. There is, however, a weighty objection, and with most people an insurmountable one, against the placing of any succedaneum in a cavity of this nature:

for the substance when introduced, assuming the shape of the cavity, is formed into a globule; one side of which rests in the concavity of one tooth, while the other rests in that of the other. Now the teeth are not so firmly fixed in the sockets, but that they are susceptible of a slight shaking motion, which if given in the smallest degree to one of the two teeth between which the stopping is placed, a small aperture will be opened between the bone and the stopping, which permits the entrance of saliva. In masticating, this, to ordinary observers, totally imperceptible motion of the teeth, must of course take place, and some of the particles of food held by the saliva in suspension, are forced into the crevices between the stopping and the teeth, and in course of time a fetor arises from the part of an exceedingly disagreeable nature.

The best way to treat a case of this kind is to extract one of the teeth, and then excavate and plug the other effectually; but very few people can be found who are sufficiently stoical to submit to an operation of extraction unless stimulated to do so by toothache.

When a small cavity is formed, the mouth of which is smaller than the inside, gold may be used with success to plug it. The principle to be observed in the use of gold is, that it should be pressed in so tightly as to be able to resist the penetration of the saliva. To know the exact amount of pressure by which this object may be attained is impossible; but though it may be pressed in too loosely, it cannot be done so too compactly; and, therefore, as much gold as possible ought to be introduced to the cavity, at the same time, applying the pressure in such a manner as not to cause injury, and when it is applied at the side of a tooth, giving due support to the opposite side to that against which the pressure is made, so as to prevent the periosteum being bruised by the shaking of the tooth.

The operation of plugging with gold is decidedly one of the most remedial operations in the surgical branch of Dentistry, and it is of so simple a nature that it is really surprising that such numerous applications should be made to dentists to have it performed. Any person possessed of ordinary ingenuity would, I am quite sure, find this operation one of the simplest nature; for surely there cannot be said to be a sage's experience requisite just to scrape or cut out the soft discoloured matter from the cavity, and then thrust in a little gold, or platina leaf. I have known several different families the members of each of which stopped one another's teeth when requisite, and I can safely say from actual examination that the operations were as well performed, and with as much success, as if done by the oldest practitioner in the kingdom. I had a tooth stopped ten years ago by a person to whom the operation was a complete novelty, yet the stopping remains good at the present time, and is likely to continue firm as long as the tooth that contains it.

Stopping with amalgam can be accomplished with even more facility than with gold, and though the greater part of the crown of a tooth be removed by gangrene, and the central cavity and pulp exposed, the amalgam may be used successfully. In those cases where it is necessary to make a bridge over the exposed pulp, care should be taken to ledge the amalgam on the bony sides, nearly at the bottom of the cavity, so that when hard no pressure can force it in, if this be not observed the mass of cement, instead of assuming the shape of a shot with a small concavity in its side, would take that of a half shot, and this, not resting upon the bone, but upon the wax, would, of course, be pressed in immediately on attempting to masticate; the soft wax would be forced against the pulp and occasion acute pain. If the amalgam be not brushed regularly it is in most mouths liable to discolouration, though in some it remains of a white metallic colour: it may always be kept perfectly clean by the same means that the teeth are.

Whenever the slightest looseness is detectable in the material with which a tooth has been plugged, as may be the case in lapse of time, the succedaneum should be removed, the cavity excavated and stopped again with new material.

The removal of calculus and other matter from the teeth is an operation of the simplest nature, one which may be performed by any person. Two small scaling instruments, or, indeed, in the majority of cases, the excavating instrument will be found quite adequate. No fear need be held, by a novice to the operation, of injuring the enamel in using the instrument to take away the calculus, as may easily be demonstrated by trying to remove the enamel from an extracted tooth by means of a properly tempered scaling instrument. A hard steel instrument ought not to be used, for this reason it is proper that new instruments should be tried with a file. If they can be acted on by a file they are sufficiently soft, but if they are hard enough to resist the file, they ought to be tempered by heat.

Not a particle of extraneous matter should be permitted to accumulate on the teeth, and unless they are repeatedly examined, and the secretions removed, scales of calculus will be deposited on them. If the members of a family, male or female, were to devote a few minutes in the course of every month to the examination of each others teeth, and the removal of incipient accumulations of calculus, much benefit would result.

In elderly persons the teeth are often found united in a mass of this calcareous matter, and a question will arise whether the removal of the calculus may not be more injurious than beneficial. When the greater part of the sockets of the teeth have been absorbed, and a large accumulation has taken place around the teeth, which on examination are found loose, I think it advisable to let the mass remain, as, in such instances, the loss of teeth may be facilitated rather than retarded by scaling. When absorption has advanced thus far, nothing from Dentistry can be looked forward to with satisfaction, except artificial teeth.

No chemical means should be adopted for the removal of calculus, as anything that will act chemically upon it must have a similar effect upon the enamel, their composition being very similar, so that if the one be injured the other will be so also. The use of the steel instrument is the safest and speediest remedy, and it may be added, that ultimately, it will be found to be the least painful; for if any preparation injurious to the enamel be used, gangrene and toothache will very soon follow.

In performing the operation, the point of the instrument must, at times, be placed so low down about the necks and interstices of the teeth that the gums will bleed slightly. This will have a beneficial tendency, as the extraneous matter generally excites considerable inflammation in the gums by continually irritating them; so that the operator need not be deterred from removing the depositions from between the gums and the necks of the teeth by the sight of a little blood. A stranger to the operation might be alarmed, also, by the breaking off of a large piece of calculus, erroneously supposing it to be a piece of the tooth. No such fear need be held for a moment; the bone of the tooth is not susceptible of fracture or cut from a mere scaling instrument. At the same time, be it strictly borne in mind, that no one can be too gentle or careful in operations of this description, and that violence is altogether unnecessary.

CHAPTER V.

Treatment of secondary teeth continued—Treatment of the diseases of the gum and socket bone—Remarks on the usefulness of the art of treating dental disease.

It sometimes happens that, when the gangrene penetrates the central cavity and exposes the pulp to the various chemical and mechanical influences of the mouth, a bud, composed of a substance similar to the gum, will be given off from the exposed portion of the pulp, and this gradually enlarging, at length fills up the cavity of the decayed tooth, and thus protects the pulp from injury. This sort of stopping succeeds pretty well in defending the pulp, though it is in some instances found to be as irritable as the pulp itself: when this is the case extraction is necessary. The removal of a tumour of so irritable a kind from the cavity of a tooth would be as painful an operation as extraction, and, at the same time, not of the least utility, as it will grow again in a few weeks. The substance, generally speaking, is not very susceptible of pain, and may be permitted to remain without any evil result.

Another means which nature seems to adopt, when the pulp becomes exposed, is to block up the exposed end of the cavity with a deposition of ossific matter. In examining a tooth that I lately extracted, I found the crown end of the cavity filled with this matter, and the pulp shrunk downwards towards the root; a cavity extended from the outer part of the tooth to the surface of the recently deposited bony substance. The deposition was evidently from the pulp; the matter is harder than ordinary bone, and semi-transparent in appearance.

Dental exostosis is to be remedied only by the extraction of the diseased tooth; indeed, no one can be certain of the existence of a deposition on the fang of a tooth till it is removed from the socket, and this operation is soon made requisite by the incessant, though not very acute pain, induced by the disease.

The disease which has been described, as exhibiting itself in the formation of grooves some-times in the cutting edges, and at others in horizontal lines near the necks of the teeth, may be delayed in its destructive progress by stopping; the gold is best adapted for the grooves in the cutting edges; for the other grooves the amalgam will be found more suitable.

The remedy recommended for inflammation in the pulp of a tooth is bleeding with leeches, and much benefit may be derived from this treatment, if it be adopted at the commencement of the pain, or immediately after; when any one feels a heavy, though not violent, aching in a sound tooth or teeth, whether accompanied with cold in the face or not, the leech had better be applied, allowing it to attach itself on the gum near the end of the root of the tooth, the lip being held forward during the operation; when the central cavity of a tooth is exposed by gangrene, the pain caused by inflammation in its pulp is of a much more piercing description, most frequently of such an intensely agonizing nature as to make the extraction immediately necessary. If, however, the pain be moderate, the application of a leech may remove it; but it is not worth while doing this if the cavity is not of such a form as will qualifiy it for stopping.

The inflammation in the periosteum of the root may often be removed by the application of leeches, though some-times it continues despite of this treatment.

Numbers of 'instantaneous cures for toothache' are daily advertised; but I am of opinion that a slight consideration of their inapplicability and bad effects, will show the majority of them to be worse than useless. Toothache may be caused by inflammation in the dental bone, by inflammation in the pulp, by exostosis of the fang, by inflammation in the periosteums, and other circumstances. Now any, or all of these diseases may exist in a tooth, and cause the most excruciating torment without admitting the possibility of the application of any kind of drug to the diseased part. In the majority of instances the seat of disease is impenetrable by drugs, and when the tooth is hollow, and the pulp exposed, chemical agents, such as muriatic acid, or a mechanical one, as the needle, if they do remove pain, also destroy the pulp and, consequently, the vitality of the tooth. The results that arise from this loss of vitality are, the discolouration and putrefaction of the tooth, which continues in the socket an extraneous and irritating substance, exciting disease in the periosteum of the socket, and inflammation and absorption in the bone of which the sockets are composed, thereby endangering the whole set.

Any thing that has not the effect of destroying the pulp occasions but a temporary suspension of pain, if any; and if bleeding has not the desired effect, the patient had better forthwith have the assistance of a dentist or surgeon for the removal of the tooth: the pain of extraction, considering its duration, is slight in comparison to the agony that must otherwise be endured.

A lady, who is resident in the neighbourhood of Birmingham, applied to me, about two years since, under the following circumstances:—The first grinding tooth in the left side of the upper jaw occasioned paroxysms of the most violent description, which came on casually by day or night, continuing for several hours, and then abating till the pain would be comparatively slight, and at times cease altogether for a short period; bleeding and other treatment had been adopted unsuccessfully. On examining the tooth I found that there was no cavity, but merely a slight indication of gangrene in the crown, while the rest of the teeth appeared healthy. The pain was such that the patient clasped her face with her hands, and gave every external symptom of intense suffering. I immediately recommended extraction; her mind, however, was not prepared for this, having imbibed the notion that it was an operation of the most alarming nature, one with which lock-jaw, broken-jaw, or bleeding to death, were almost always connected. Though it was in vain that I endeavoured to remove these suppositions, still the attempt was beneficial, for the patient's attention being attracted by the subject under discussion, and alarms being excited by my recommendation, the pain, as it often does under such circumstances, suddenly ceased. Shortly afterwards she withdrew, not being able to reconcile herself to the operation.

About a month had elapsed when the lady again consulted me. She stated, that during the interval that had transpired since her previous application, she had tried numerous different drugs, some of which sometimes gave temporary relief, but not always, and that latterly the pain had harassed her so much that she had determined to have the tooth extracted at all hazards. After the operation, the lady animatedly expressed her regret that she had borne agony so long when it might have been removed with such comparatively trifling pain. On examining the rest of the teeth, I found that the enamel on several of those adjoining to the place of the extracted tooth had been decomposed; it was soft and chalky, and on thrusting a steel point in it, the bone of the tooth was easily penetrated to, and pain excited; the teeth on the left side of the lower jaw, also, had their enamel severely injured. I communicated to the patient my conviction that her newly acquired opinion, respecting the operation of extraction, would, I apprehended, soon be severely tested, and then described the effects produced on the enamel of her teeth by the drugs she had used, and the consequences that invariably follow these effects. Since that time the lady has suffered several operations. Some of the teeth I have been able to preserve by means of enamelled caps, others have been extracted, and their places occupied by porcelain teeth.

This is but one out of the crowd of instances of individuals being put in this manner to pain, trouble, and expense by the empiricism of ignorant people; the regular practitioner meets with analogous incidents continually.

Supposing the pulp to be exposed and the patient is desirous of obtaining a temporary relief, a little lint, dipped in laudanum or spirit of tar, may be thrust into the cavity with casual benefit to the patient, and without the injurious effects produced by the application of an acid. If any thing is calculated to soothe pain in the pulp of a tooth one would think opium the ingredient; but in many cases it will be found inoperative.

We often hear of sudden cures of toothache by chemical applications, but I think sufficient has been said to show that, in general, the causes of disease are beyond their reach. The sudden temporary removal of pain, which often occurs after an application of some nostrum to a tooth, the disease in which cannot be approached, or in the slightest degree influenced by the treatment, is to be accounted for on metaphysical, not on physical, principles; charms and incantations often having a similar effect on ignorant, weak-minded people, who are not in possession of correct ideas of causation, and are possessed of much faith or credulity.

Diseases in the gum or socket bone sometimes arise from the irritation produced by dead roots, or by bad teeth; at others they have their origin in constitutional causes. It may be laid down as a general rule, that if any abscess or tumour appears in the neighbourhood of a root or diseased tooth, it should be extracted, when it will generally be found that the abscess will heal, or if a tumour exist, that on cutting it away a cure will be effected; but if the irritant body be allowed to remain no cure need be expected.

Lifeless teeth and roots always have a bad influence on the socket bone, exciting in it inflammation and other affections incidental to it.

What is commonly termed a gum boil is nothing less than abscess in the socket bone, causing a swelling in the gums. The abscess is generally formed at the roots of dead teeth; these irritants excite inflammation in the periosteum, and a sac is formed round the extremity of the root, in which pus is deposited. This leads to further inflammation, and the pus pressing for an outlet, a canal is soon absorbed, and the matter gains an issue, generally somewhere on the gums, but sometimes at the outside of the cheek.

When extensive inflammation is excited in the socket bone, and absorption commences its devastation of the teeth, the case is hopeless; for, however we may impede the progress of the disease by the removal of all the calculus, and dead teeth, and roots, and other irritants, and though from time to time lancet and leech may be used for the purpose of unloading the vessels of the inflamed parts, still the absorption goes on, and though it may proceed more slowly, its ultimate havoc is not a whit less certain. The sockets retire gradually from the necks of the teeth, giving them an elongated appearance; the want of support about the neck induces looseness, which adds to the irritation and stimulates the disease which progresses till the teeth being one by one deprived of the support of a socket, fall away from the gum. This disease is sometimes rapid in its destruction; but more generally slow. The treatment prescribed for it is copious bleeding of the parts, the removal of all irritants, and the application of astringent washes to the surface of the gums, of which washes, perhaps, a solution of bark will be found as good as any. When the gums are spongy, and liable to bleed on slight pressure, alum water has been strongly recommended, but it must be used with great care; for being composed of sulphuric acid, alumina, and potash, and one of the principal constituents of the teeth being lime, when a solution of alum water is held in the mouth, the acid having a stronger affinity for lime than alumina, decomposition of the surface of the teeth commences. For this reason when alum water is used, it should be placed with a pencil brush on the inflamed gum, and kept carefully from the teeth. From the indiscreet manner in which this solution has been recommended much evil has arisen. I have no hesitation in saying that whole sets of teeth have been destroyed by its improper use, and any one can demonstrate its highly injurious nature by the simple experiment of putting a tooth into alum water for a time, and then allowing it to dry, when the experimenter will find the enamel decomposed and reduced to a chalky sort of substance. This is a fact; yet in almost every book treating on this subject the indiscriminate use of alum solutions has been recommended.

In addition to the affections described, the teeth are subject to numerous other evils. In illness the use of an acid medicine may destroy the set, or the use of mercury may inflame and absorb the sockets, and so remove the teeth from the mouth: pains in the jaw will sometimes arise from some unknown cause, in the hope of relieving which the patient will insist on the extraction of teeth: mechanical injuries, such as the gradual wearing away of teeth by friction against each other has a destructive tendency: accidents occur daily whereby human jaws get more or less shattered, and teeth disruptured; so that taking all liabilities into consideration it may safely be said, that if we had not the means of restoring teeth, Dentistry would be exceedingly deficient, and, indeed, nothing more than a branch of surgery. The treatment of gangrene, the removal of calculus, the application of a leech, and other operations, are within the compass of most capacities, and as for the extraction of teeth and roots any surgeon is fully qualified for the operation, which may be classed amongst the simplest in surgery.

For tooth drawing, it is requisite that the operator should possess an accurate knowledge of the jaws and sockets, of the shapes of the different teeth, and the mode of applying the instruments. The ample opportunities that a surgical student is possessed of, to make himself fully acquainted with these, would naturally lead us to expect the surgeon to be more adequate to perform the operations of this kind than any other person. This expectation is correct; the surgeon is best qualified for the operation if he choses to perform it. There are, also, two other advantages in having teeth extracted by a regular surgeon; he is, in the first place, accustomed to operations of a much more extensive nature than merely extracting a tooth, and may, therefore, be expected to have more coolness and deliberation than one who is not accustomed to surgical practice; secondly, if any extensive hemorrhage or accident occur, he is decidedly the most proper person to treat for it.

For these and other reasons, whenever I have required a tooth to be taken from my own jaw, I have had the assistance of a surgeon who practised the operation, and I have always had it performed with the greatest expertness.

The principal diseases incidental to the teeth, and also their treatment have now been laid before the reader, and the glaring inadequacy of the latter must be palpable. The knowledge of disease may be acquired, but the knowledge of remedies very often cannot.

How frequently is it the case that a young medical man, with his head full of theories and his heart of enthusiasm, will talk in a confident strain about restoring health to his patient; when, at the same time, that patient is actually irretrievably lost. In a similar way, some writers on Dentistry have frequently expressed the opinion that, by surgical art, the diseases of teeth and gums might be extirpated, and perfect dental health insured. Let no one be deluded by this fallacy; the surgical art of Dentistry is by no means adequate to do this, however useful it may be in temporarily checking disease. No reasonable person expects that the medicinal art, highly cultivated as it has been, can preserve the human structure from the ravages of disease; why then expect so much from Dentistry?

There is, however, one feature in this art which enhances its utility much; that is its extreme simplicity; most of the treatment being within the reach of any person who chooses to take the necessary trouble.

It would be much more honourable on the part of a practitioner, in all circumstances, to state fairly whether he can remove a complaint or merely retard its advance, and when, from absorption of the sockets, teeth are actually falling out, how unfair is it to impose on a patient by saying, that the loose teeth may be tied so that they will fasten, and that the gums and sockets will grow again; yet this practice is common. I have never seen nor heard of absorption being effectually stopped in its devastating career, and until a satisfactory remedy be discovered the surgical dentist must not vaunt of the invincibleness of his art. Again, when sudden and violent inflammation ensues in the pulps of the teeth, and in its wake mortification follows, and the vitality of the tooth is destroyed, what is to be done? 'Oh,' exclaims the advocate for the invincibility of the art, 'because we cannot restore life to a dead tooth, it is no reason why we cannot protect and support life in the living one! Bleeding should have been had recourse to at the commencement of the inflammation.' In reply to this it may safely be said, that there are plenty of instances of this kind in which *bleeding*—excessive bleeding—of the parts has been tried from the beginning without the pain or the inflammation in the pulp abating till mortification ensued.

In cases of exostosis of the fang, what can the art do? plainly, nothing more than tell us that the tooth must be removed for the purpose of saving the patient from pain, and his dental sockets from inflammation. Numerous are the instances which might be adduced to show, that this art is by no means equal to what some practitioners wish it to be thought, and those who do cherish the idea that it is adequate to render useless what is called the mechanical branch of Dentistry, which teaches us how to construct artificial substitutes, hold an opinion that cannot be substantiated, and which must, indeed, vanish away after a fair investigation of the subject.

My object in making the latter observations, is to show what the art cannot do, sufficient has been said before to point out what may be expected from it. That it is highly serviceable, every candid mind will readily admit, and though the doctrine of its invincibility cannot be allowed, that of its utility must.

The knowledge of the nature and diseases of the teeth, forming branches of osteology, physiology, and pathology, is of a highly interesting and important nature, pointing out to us the operations of nature in us, and the causes of organic derangement. It is surprising to me that those who have examined and written on these subjects, have not more forcibly expressed their opinions respecting the predisposing causes of dental disease. They warn the readers against exciting causes, such as using too hot or too cold food. These causes are often unavoidable; the mere action of breathing through the mouth (which, though unnatural, many people do unconciously) creates a sufficient transition in the mouth, on a cold day, to induce inflammation, if the bone of the teeth be predisposed to it.

The general pathologists have long since declared the fact, that the habits of a society, if unnatural, form the predisposition to disease of all kinds, and dental pathology affords corroboratory proof of the same fact. This then enables us to give a proper answer to the question—why do people's teeth decay so fast?—or, why do the gums recede at about forty years of age?—or, how is it that continual brushing is necessary to keep the mouth in a state of cleanliness?

The great acceleration in the progression of popular intelligence, that has taken place within the last few years, permits me to indulge the hope that ere long human nature and its liabilities will be generally understood, and the deductions of philosophy be made the moving principles of the public mind. Until science sways the sceptre, individuals must remain in their present state of extreme liability to suffering. No man can be certain of his freedom from disease who lives in ignorance and habitual neglect of natural laws, and how can he do otherwise in society like the present? There are diseases peculiar to each class, and there are those common to all. The luxurious and the laborious daily fall before us victims to their modes of life; and though, now and then, we hear of a man living to fourscore years, without a day's illness, or the loss of a single tooth, every one will admit that the instance is but a solitary exception to a fearfully contrary rule.

CHAPTER VI.

Cases illustrative of dental surgery—Case of prominency of the lower jaw—Cases of confusion of dental position—Exostosis of the root—Gangrene—Grooving disease—Calculus—Abscess of the socket—Miscellaneous cases.

NOTHING can tend to show the degree of utility of any art, and how far it may be depended on, better than a fair report of cases in which it has been correctly practised; from it something like rational views may be drawn.

Some of the following cases, I quote from the writings of gentlemen, whose testimony may safely be relied on, others have come under my own observation; they are all illustrative of the principles and practice which I have attempted to explain in the former chapters of this work.

Mrs. L. applied to me in June, 1834, to have my opinion respecting her children's teeth. On examination, I found that Miss E. L., aged 13, was possessed of a prominency of the under jaw, a characteristic which also distinguished her father. A silver instrument was made, and the young lady requested to use it night and day. This request was not paid much attention to, and consequently little effect had been produced by the instrument, the next time I saw her, which was about a fortnight after its having first been worn. I explained the necessity for its being worn continually, meal times only excepted, and promised that, if such a course was perseveringly adopted, the object aimed at would be attained in a fortnight or three weeks. The direction was paid the most rigorous attention to, and by the use of the instrument pressure was caused at the insides of the upper cutting teeth, and at the outsides of the lower almost continuously during the space of three weeks, when I again saw the case. I found, as expected, that the under teeth struck inside of the upper, the irregularity having been removed. The success of the case gave great satisfaction to Miss L.'s father, he having lost several of his cutting teeth owing to their irregular action.

In 1834, a young gentleman, about 15 years of age, belonging to the school of Messrs. H. and R., of Birmingham, applied to me. His jaws were not sufficiently expanded to permit the formation of a regular dental arch, and several of the teeth were in such positions as hindered them from being pressed towards their places by the action of the tongue and lips. The latter circumstances were removed by the use of the silver instrument, but the boy's parents having adequate jaws, and he being robust and growing rapidly, his jaws, also, evidently expanding, I deemed it better to leave the case to nature, assisted now and then by the use of the silver instrument, than resort to extraction. I have not seen the case latterly, and cannot make a satisfactory report respecting the result; indeed, it will be impossible to do so till the young gentleman has attained his full growth, when, if it be necessary, extraction may be resorted to.

In 1833, Miss H., aged about 18, consulted me. She said ,that at the time she was shedding her teeth her relations had taken her to a celebrated dentist who extracted four of her primary ones, and directed her to call on him again on the earliest opportunity. She was again taken, and again had four teeth removed. She was treated for several years by this practitioner, and when the secondary set came it was in the most lamentable confusion, a state which she was told demanded the extraction of some more teeth. She was compelled to submit to this, and the confusion of dental position, instead of being remedied, was increased till her mouth was actually disfigured by the derangement of the upper front cutting teeth. On examination, I found that the upper cutting teeth were so displaced as to give the whole mouth a distorted appearance. I said, I regretted exceedingly that it was not in my power to remove the disfiguration by any other means than the extraction of three upper teeth, which occupied the place of the two front cutting teeth, one of which had been extracted for many years. If this were permitted, two artificial teeth would fill up the aperture in so perfect a manner as to be undetectable. The operation was submitted to, and the artificial teeth fixed. These have been worn with the greatest comfort, and were as good and durable the last time I saw them, which was about three weeks since, as they were the first day they were fixed.

The following case of exostosis of the fang is one reported by the late Mr. Joseph Fox, formerly Lecturer on the structure and diseases of the teeth at Guy's Hospital.

"Of this disease of the teeth, the most extraordinary case on record occurred to a young lady scarcely twenty years of age. The following letter, from the surgeon who had attended the lady, and by whom she was introduced to me, presents a full narrative of the case:—

'9th Nov. 1809.

'SIR,—Miss ——, the young lady who will deliver this to you, has been under my care for near twelve months, with a very extraordinary complaint in her face, teeth, and gums. It commenced with a deep-seated pain in the face, confined principally to one side, returning most mornings at about eleven o'clock, and continuing several hours. This had gone on for near three months, before she or her friends thought it sufficiently serious to call in any medical assistance. When first I saw her, she had suffered great pain all that day, from the teeth, gums, and face; on one side the gums were rather swollen and inflamed; and as one of the teeth was slightly decayed, I thought it most advisable to extract it, which gave relief till the next day, when the pain returned with still greater violence; so much so, that she was desirous of having the adjoining tooth taken out, which she fancied gave her more pain than the rest. This had the same effect as the other, only giving relief till the next day, when the pain returned with equal violence. I then tried scarifying the gums, cold lotion to the face, giving at the same time a brisk purgative, and afterwards an opiate. This was continued for a short time without abating the pain; I then changed the plan for the more soothing one of fomentation and poultice, applying a fig to the gums, occasionally changing it for a crust of bread soaked in warm milk, taking at the same time a saline and opiate draught every four hours; but with just the same effect as the preceding remedies. In short, the pain in the teeth and face continued, the gums became partially ulcerated, and in the course of six months I was under the necessity of extracting, at different times, all the teeth in the lower jaw, excepting the four incisors, which very soon became affected in a similar way to the rest: these her friends would not allow to be drawn; nor was I desirous of performing the operation, as the removal of the others did not appear to have given any permanent relief, excepting that the gums healed, and remained well where the teeth had been extracted. During this time almost every remedy that could be thought of was tried, such as frequent scarifying of the gums, leeches, permanent blisters to the lower jaw, and behind the ears, astringent lotions, as the infusion of roses with the tincture of myrrh, decoctions of bark, oak bark, infusion of galls, solutions of alum, argentum nitratum, salt and water, lemon juice, oxymel æruginis, borax, charcoal and soda, tepid bath, artificial sea bath, and afterwards sea bathing, seaton in the neck, issue in the arm, &c. &c. with a great many other applications which it would be useless to name. Internally she has taken strong purgatives, calomel combined with antimony, and afterwards continued alone in small doses to salivation, solutio mineral. solut. calc. muriat. bark, with nitrous acid, steel, lemon juice in large quantity, tinct. opii, to the amount of gut. 60 at bed time, and repeated in small doses during the day at short intervals, cicuta, &c. &c. prescribed by an eminent physician in this place, without receiving little more than slight temporary relief from any one medicine prescribed. She has now all the teeth of the upper jaw affected in a similar way to the lower; the palpebræ of one eye have been closed for near two months, and, when opened, can discern objects but very imperfectly; the secretion of saliva has for sometime been so copious as to flow from the mouth whenever opened. She is now come to London purposely for advice, and I have recommended that she should call upon you.

'I remain, Sir,

'Your obedient Servant,

'T. S.'

"This letter not only fully describes the very afflicting case, but also shows that medicine under every form had altogether failed:

of course no benefit could be expected from a repetition of any similar treatment.

" At the time I saw the lady, she was only able to take fluid nutriment, for the teeth of the upper jaw were so very tender that the slightest touch caused extreme pain. As described by Mr. S. the flow of saliva was so considerable that there was a continual necessity of discharging it. The lady herself said she was assured she should never get well, unless all her teeth were extracted. It was, however, desired, if possible, to seek such relief as should prevent so painful an expedient which could only be regarded as the last resort.

" Dr. Babington and Mr. Cline were consulted, who prescribed a blister on the head, to be kept open by the application of the *ceratum sabinæ*. This was tried without success. The pain in the mouth, the sorenes of the teeth, and the general irritation on the constitution, all combined to render the extraction of the most painful tooth advisable. This was the first molaris of the upper jaw, situated under that eye, the palpebræ of which had become closed.

" The fangs of this tooth were much enlarged, and from the periosteum being greatly thickened, the fangs had the appearance of being cartilaginous. The removal of this tooth was attended with great benefit; as, in two days after the operation, the affected eyelids so much recovered as to open simultaneously with those of the other eye. This relief unhappily was of short duration; and as the other teeth remained very sore, the lady determined to have them extracted one after the other. She submitted to this operation every two or three days. The fangs of those teeth which had caused the most pain were the most enlarged; but each partook of the disposition to *exostosis.*

" The relief from pain, which was experienced by the loss of the teeth, was so great that, with the utmost resolution, this afflicted lady persevered until every tooth was extracted. After the loss of the teeth, from time to time, portions of the alveolar processes exfoliated, which rendered it necessary to scarify the gums. I am happy to say that a material improvement has taken place in the general health, although not so perfectly as could be desired. One most important benefit resulted from the removal of the teeth, in arresting the progress of the other diseased actions; for the other eye had began to be affected; and sometimes was so dim as scarcely to enable the lady to guide herself about the house. In point of appearance, however, I had the satisfaction of completely restoring the lady; the teeth which had been extracted were replaced, as an artificial set; which, with the greatest comfort, she has now used for more than twelve months."

Mr. O. had lost several teeth by gangrene previous to applying to me; I found that four grinders were diseased, and that the disease was rapidly progressing. The discoloured bone was cut out and stopping had recourse to, since which time (though some years have elapsed) the decay has not in any apparent degree advanced, and the stoppings retain their situations firmly.

Mr. Bell, present Lecturer on the anatomy and diseases of the teeth at Guy's Hospital, relates the following case :—

"I was sometime since sent for to visit a lady, then under the care of two medical gentlemen of eminence, who was suffering most severely from this cause. About a fortnight before I saw her, the *dens sapientiæ* of the lower jaw on the left side had been improperly filled with gold, notwithstanding the pressure was found to give severe pain, which she was assured by the operator would speedily subside. It increased, however, during the night to the most excruciating degree; but still an anxiety to preserve the tooth, and a reliance upon the assurance which had been given, that the pain would not continue long, induced the patient to refrain from having it extracted. On the second night the face became considerably swollen, and the elevators of the jaw were so contracted, that it was impossible to open the mouth, even to the smallest extent. Fever soon after came on, which continued up to the time when I saw her, accompanied still with severe pain and continued swelling of the face, and contraction of the muscles. Bleeding, both local and constitutional, had been employed by the medical attendants, who concluding, from the mouth being so forcibly closed, that nothing could be done towards effecting the extraction of the tooth, had directed their attention exclusively to the reduction of the inflammation and fever. At length, however, the constitution became so much reduced by the continuance of fever, the loss of blood, and the difficulty of taking nourishment, occasioned by the total immobility of the jaw, as to excite the most serious apprehensions for the result. In this state was the patient when I saw her. The cheeks were flushed, the lips parched, the skin burning, and the weakness at the same time so great that she could scarcely speak or make the least exertion. Leeches were again applied to the angle of the jaw, and the face was constantly fomented, whilst at the same time I began to attempt some mechanical means for moving the jaw. With some difficulty I succeeded in introducing a thin piece of wood between the front teeth; and having once effected the slightest separation of the jaws, I proceeded to insert a wedge of wood between the teeth, which was occasionally introduced with sufficient force to obtain some increase of space by every renewed application of it, until I was enabled, in the course of time, to introduce a small pair of forceps, and extract the tooth. From this time, notwithstanding the exhaustion consequent upon the operation, and the preliminary operations for it, the irritation and fever subsided, and the health was speedily restored.

"On removing the gold from the tooth, the cause of all the mischief became sufficiently obvious. The bone of the tooth had been softened by gangrene quite to the centre, and as it was not removed previous to the insertion of the metal, it was pressed against the membrane, and thus became the cause of the irritation which produced such frightful effects."

About six years since a cavity was formed by gangrene between the second and third grinding teeth on the right side of my own upper jaw, and shortly afterwards another was discovered between the second and third grinders on the left. These cavities were stopped with cement; but it causing a slight fetor from the parts, I had the two secondary grinders extracted by Mr. B., surgeon, of

Birmingham. The operation being performed, Mr. B. was enabled to examine the cavities in the two third grinders which were now exposed to view. The cavities communicated with the central pulp, and the bone was so irritable as scarcely to admit of touching. The immediate use of gold, in such circumstances, was out of the question, and as I had previously proved the effects of applications to the exposed pulp to be extremely doubtful, Mr. B. stopped the cavities with amalgam, by way of experiment. At the commencement of the operation a cold instrument was used to press in the cement, this occasioned considerable pain, but on the instrument being slightly heated further pain was completely avoided. A period of four years has elapsed since, and no pain has been excited in these teeth; the stopping in one of them, together with a flake of the enamel off the side, broke away about a year ago, but the other continues to hold its place excellently well. I have known many similar instances, though it often happens that irritation is created in such a degree as to demand the removal of the amalgam; this is easily accomplished with an excavator, if desirable. In most cases an exposed pulp may be covered by wax, but when it cannot, or when the bone is highly sensitive, applications such as laudanum, spirit of wine, brandy, spirit of tar, alum water, &c.; may be introduced to the cavity in a little lint as a preparatory step to the stopping of the tooth. These may be tried, though they are often unsuccessful in removing sensitiveness.

Mr. W., an elderly gentleman, now resident at Malvern, some years since requested me to give him my opinion respecting his teeth. The disease which has been described as exhibiting itself in the formation of grooves, sometimes in the cutting edges, and at others in the enamel, near the front part of the necks, had made sad havoc with his under cutting teeth, the greater portion of the crowns of which having been removed by the disease, gave the teeth the appearance of having been filed, and the top grooved with a sculptor. When the mouth was shut, a substance upwards of the eighth of an inch thick could be thrust between the lower and upper front teeth, so much had they been divided by the disease. The pulps had retired towards the roots on the exposure of the central canals, and the tops of the cavities had been stopped by a deposition of ossific matter. This not proving sufficient to prevent pain on the presence of hot or cold fluids in the mouth, Mr. W. applied to a dentist who excavated the grooves, so as to capacitate them to hold a gold stopping, and then stopped them. Mr. W. was of opinion that the stopping had slightly impeded the progress of the disease. At the time that I saw the case, the stoppings were slightly loose, owing to the enlargement of the groove by the disease. After confessing my inability to yield him benefit, I recommended him to procure a small stopping instrument, and whenever he discovered looseness in the stoppings to press them firmly into their grooves. Since then Mr. W.'s brain has unfortunately become affected so as to preclude intercourse with him, and for this reason, I have not had an opportunity of witnessing the progress of the case.

Mr. George A. had the whole of the crowns of his cutting teeth removed by this disease in the course of six years, despite the utmost exertion of his medical adviser and also of his dentist.

Mrs. W., a regular patient of mine, was attacked by this grooving dental disease. The groove extended in a parallel line with the gums, along the upper parts of the fronts of the upper cutting teeth and small grinders, and, also, just above the necks of the lower grinders at the outside. All these teeth have been kept stopped with amalgam for these last five years; but it does not appear to me to be at all probable that they can endure for the natural term of the patient's life; it was, however, made certain, by the rapid progress of the disease, previous to the use of the amalgam, that if it had not been used the grooves would have got so deep in the structure of the teeth, that the action of mastication would long ere this time, have broken several of the crowns from the roots; at present some of the teeth are nearly half cut through by the groove, but a solid support is yielded by the amalgam.

The following instance of the effects and treatment of tartar or calculus is quoted from Mr. Fox:—"I have seen many cases of great soreness and extensive ulceration of the parts of the mouth, arising from large accumulations of tartar. A lady from the country applied to me, complaining of a sore mouth, which had baffled all the attempts made by a very skilful surgeon to heal it. The inside of her cheek was in an ulcerated state, and under the tongue, at the frænum, there was a considerable thickening, with a line of ulcerated surface. She had been in this state for more than twelve months, and could only obtain temporary relief from any application. Her teeth were covered with an immense quantity of tartar: the edges of this substance being very ragged and sharp, were continually cutting into the soft parts that pressed against them. Sometimes a small portion would break off, when, from the new edge being very sharp, much irritation immediately ensued. I removed the tartar at intervals, the sore places healed, and since that period, by an occasional removal of newly formed tartar, her mouth has continued perfectly well.'

Mr. F.'s second pair of upper cutting teeth had been attacked by mortification in their pulps, which destroyed their vitality. The teeth loosened, and an abscess forming in the bone over the root of each, a discharge of matter through the gums, covering the outer plate of the sockets, took place; both of the teeth were extracted, and shortly afterwards the abscess healed, and the gums being restored to perfect health, artificial teeth were fixed.

A gentleman applied to me some weeks back, complaining of a dull aching in the upper jaw, which seemed to arise from the front upper teeth; he was labouring under the general effects of a cold. By the aid of leeches, warm bath, &c. he was in a few days restored to perfect health. The bone of the teeth was sound, and the pain evidently arose from inflammation in the pulps, which, if it had not been checked, might probably have induced mortification in them.

Miss T. having suffered much pain in one of her grinding teeth, determined to have it removed: the operator consulted accidentally broke the tooth, unfortunately leaving a portion of one of the roots so firmly fixed in the socket that he was unable to remove it. This excited a great deal of pain and heaviness of feeling in the antrum, together with such alarming symptoms in the jaw, that the lady resolved on applying to another practitioner respecting its removal. I was consulted, and of course strongly recommended the immediate removal of the root, as it appeared to affect the antrum seriously. The operation was readily agreed to, and borne with fortitude. The root, when extracted, had a bulbous appearance, owing to the diseased state of the periosteum. The pain together with the other morbid symptoms abated gradually, and soon afterwards entirely ceased.

Miss Y. had been affected for years by a violent pain in the face, which generally came on at bed time, and continued during the night. She would sometimes be free from it for a month or so, and then it would attack her with its usual intensity, and at the usual time. From the harassing nature of the pain her general health had been impaired, and medical aid had in vain been tried for her relief. Her surgeon adopted the usual means of ascertaining whether it was in any way connected with the teeth; each of them was struck with a steel instrument, but the experiment was unsatisfactory. On being applied to, I repeated this experiment of striking the teeth, but could discover no connection between any of them and the pain. I inquired of the patient if she had ever observed any sympathy betwixt any of her teeth and the pain by which she was so much afflicted; she said it seemed to arise from the hinder part of the left side of the upper jaw. On examination, I found that the wisdom tooth had not yet passed through the gums, and on thrusting a steel point through, and causing sudden pressure on it, the shooting pains commenced; this circumstance decided the mode of treatment. The tooth was extracted with facility; for about five minutes after the operation the pains continued with much violence, they then abated and soon ceased. The affection has never returned again, and the lady is now in possession of good health and a most excellent constitution.

Mr. W. had long been troubled with abscess of the gums; on examination a number of dead teeth and roots were detected: on their removal the gums speedily healed, and he was no longer annoyed by the presence of purulent matter in his mouth.

CHAPTER VII.

Dentistrical mechanism—Artificial teeth—Qualities desirable for them—Rival substances and modes of fixing—Human teeth objectionable—Superiority of porcelain teeth—Consideration of the reasons for their general use as dental substitutes, and of the objections advanced against them—Composition and mode of preparation—Concluding remarks.

SURGERY, Medicine, and Dentistry were once professed by the barber in common with the arts which he now practises. They, however, gradually expanded so much that an individual's whole attention to one of these professions became requisite to enable him to practise it with satisfaction to himself and patients. But what is it that has enlarged Dentistry so much as to make it demand a person's whole attention. Is it the knowledge of the structure, functions, and diseases of the teeth? Manifestly not, for the most dull student could make himself acquainted with all that is known of these in a week! Is it necessary that long years should be consumed in the attainment of the experience sufficient to enable a person to perform those simple—I may say—those trifling remedial operations which have been described, such as brushing, scaling, and stopping, each and all of which can be performed by any one? Certainly not. As for extraction, it properly belongs to the profession of Surgery, though the blacksmith, barber, bleeder, druggist, apothecary, and dentist often vie with him in this art, frequently to the very great detriment of the human jaw. What, then, is it that requires so much experience to enable any one to practise this profession? What is it that has expanded it? Palpably the art which teaches the mode by which dental substitutes may be fixed in the mouth in lieu of those swept away by disease or accident. This is a mechanical art, and requires years of experience in it before a person can attain to that degree of skilled labour which is essential to the practitioner.

There are several qualities of which artificial teeth ought to be possessed; in the first place they must perform the functions of cutting, grinding, and saturating the food with saliva; and to do this they must fit the jaws with the greatest accuracy. Their appearance in the mouth ought to be so similar to that of real teeth as to be undetectable; and above all, considering the locality in which they are placed, they ought to be composed of a cleanly substance, capable of resisting the chemical influences, and of sustaining the mechanical action to which there is any liability in the mouth.

Bone is the substance which has been commonly used for this purpose; the tusks of the elephant and hippopotamus, and various other descriptions of osseous matter, are consumed regularly by most dentists.

A mould is taken of the jaw in bee's wax, and from this a plaster-of-paris model is cast; on the model the bone is fitted with a sculptor, and then filed in the shape of teeth. Sometimes the bone is cut and filed into a thin plate, on which natural teeth either of the human being or the larger monkeys are rivetted.

A French jeweller, in the last century, made a considerable improvement in the art by introducing to use gold plates instead of the bone ones. On these gold plates, which are formed by means of a stamp, similar to that described when treating of the removal of dental irregularities, are fitted either natural teeth or those cut out of bone, and when neatly fitted they are fastened on the plate by a screw and rivet, or a peg.

Bone instruments containing a small number of teeth are generally fixed in the mouth by wires or threads, which attach them to the adjoining teeth; but when a whole set is required, spiral springs are used to support the plates on the jaws. Latterly these bone plates have sometimes been fixed on a pneumatic principle. The plate is made to fit the gum accurately, so that, on being placed in the mouth and pressed on the gum, the atmospheric air is excluded from between it and the gum; on this pressure being stopped the instrument rises slightly, and a vacuum being formed at the inside, the pressure of the air on the outside holds the instrument against the gum.

The gold plates are fixed by clasps on the adjoining teeth, and when this support is not to be had, gold spiral springs are resorted to; plates of this description are much firmer and more durable than the bone ones.

Mr. Hunter introduced a practice of transplanting teeth, which has since been given up owing to its painfulness, inadequacy, and lamentable consequences. He recommended where a tooth was diseased that it should be extracted, and at the same time a healthy tooth, corresponding with it in shape, should be removed from the jaw of some other person, and immediately thrust into the socket from whence the decayed one was taken. It is very plain that if this transplanting were successful, no general good could result; for the evil inflicted on one person would be paramount to the benefit gained by the other; so that, in a moral view, supposing the practice efficient, it would still be void of utility.

Transplanted teeth do not retain their vitality, but become extraneous irritants in the socket, always tending to excite disease, and never becoming perfectly fast, nor do they even retain their colour; but get gradually darker, so that we may conclude fairly, that this practice is neither efficient nor desirable: it has always been exceedingly painful, sometimes led to the death of the patient, and never been very advantageous in any recorded instance.

Another plan for fixing upper cutting teeth is to file off the decayed crown close to the gum, leaving the root in the socket; the central cavity being thus exposed the pulp is destroyed, sometimes by a hot needle being thrust into the cavity, at others by being crushed by a wire. The process of destroying the pulp is always attended with excruciating torture, worse by far than the pain of extraction, it is in fact a barbarously cruel operation, and disgraceful to the practiser of it. When, however, the pulp has been destroyed by mortification this objection no longer exists. The central cavity of the root being drilled out, the crown of a corresponding tooth is fitted to the root; a wire is then screwed into the crown, and the end of it shortened and tapered so as to fit up in the central cavity. Round this wire a little thread is wrapped so as to make it fit tightly, it is then thrust up into the canal formerly occupied by the pulp, and the new crown is thus grafted on the old stump.

This latter mode of fixing teeth can be adopted very seldom, owing to the almost general absence of the circumstances requisite to enable the practitioner to avail himself of it. Even in the very few cases where the plan may be acted on there are objections to it; for it violates the general rule that all dead roots should be removed from the sockets, and also, if great care be not taken, a breath-polluting fetor will arise from the cavity of the stump which must be highly disagreeable.

The presence of any dead osseous matter in the mouth is objectionable, on account of its decomposition, effluvia, and discolouration. The bone of which artificial teeth are made soon becomes saturated with saliva, and becomes exceedingly disagreeable. The idea of having human teeth in the mouth is shocking, and this objection added to the fact of their decomposing when placed there, is sufficient to deter most people from using them. But there is another objection, which I have before advanced against this practice of using human teeth, namely—the creating of motives powerfully inductive of crime. In England there are thousands of dentists who regularly use natural teeth; a walk through any of our large towns, but particularly the metropolis, will give a person some notion of their numbers; indeed, in London, there is scarcely a street without one of them. Some of these artists gain from five to ten thousands a year, others have not, perhaps, so many hundreds annually; however none, we may rest assured, will continue practice without gaining by it eighty or a hundred a year, the rent in any suitable situation demanding half this sum. Now if we take into consideration the number of these artists, and the income received by them, greater part of which is for fixing human teeth, what an immense consumption of these teeth there must be,—some practitioners requiring thousands, others hundreds every year! But the supply of an article, we are told by political economists, is always regulated by the demand created by its consumption; then what an immense supply of human teeth is annually had in England! It is requisite that they should be strong and healthy—where do they come from? so vast a quantity! How are they obtained? I have before stated all that I could say, without being personal, in answer to these questions; and allow me to add my conviction, that if this iniquitous business was properly investigated, a detail of horrors would be made known that would at once authorize legislative interference to put a stop to this practice.

The plan of fixing these animal substances for artificial teeth is an old unimproved one, which was as well known to the antients as it is to us, and even the school boy, in conning over his classic lesson, will often have a feeling of scornful derision excited against the practice by such lines as these:—

> "Thais habet nigros, niveos Lecania, dentes.
> Quæ ratio est? emptos hæc habet, illa suos."

Had porcelain teeth been known to the Roman dentists, and the mode of properly fixing them, Thais might have availed herself of substitutes, for the use of which she could not have been so sarcastically taunted. Animal substances being objectionable, and vegetable ones unsuitable, resort must be made to mineral, among which porcelain immediately presents itself.

There were three individuals prominently instrumental in making known the mode of manufacturing china to the Europeans. The first was a missionary, who, at the beginning of the last century, being stationed in China, contrived, it is said, to steal a quantity of the separate components of the ware, and forward them to Europe, with some details respecting the manufacture. About the same time the Baron de Botticher, a German gentleman, who amused himself by wandering in the mazes of alchemy in pursuit of the philosopher's stone, while preparing some melting crucibles for his experiments, made a porcelain ware, which, on comparison, he found to be similar to that of the Chinese. He gave up alchemy and devoted himself to the more lucrative pursuit which chance threw open to him: an extensive manufacture of china was soon commenced in Dresden; but the components of the ware, and the process of making it, were kept profoundly secret. After this one of the French philosophers, the celebrated Reaumur, instigated by the disinterested public spiritedness common to them, devoted himself to an inquiry into this subject, and bringing his scientific knowledge to bear upon it, soon, by examination of the wares of China and Dresden, and also of the earths obtained by the missionary, discovered that porcelain was a compound of two earths, one of which fused into a glass, while the other baked into a white opaque substance, and that the semi-transparency of china was produced by these earths being mixed, and the compound submitted to a heat sufficient to fuse and vitrefy the one ingredient and bake the other. Reaumur immediately communicated his discovery to the Academy of Sciences, by which body it was published, and the mystery of the manufacture exploded.

The French dentists were not long in perceiving the utility of porcelain in their art, and though they had many difficulties to contend with, still artificial teeth of this substance were extensively used. The colour was not exactly natural, but their perfect cleanliness made amends, and completely overruled this objection with those persons whose object in using them was mastication.

The introduction of these teeth to use in England drew forth the objection to their colour, and we find the writers of that period unanimous on this point. Mr. Fox says, "of late years they (artificial teeth) have also been made of a porcelain composition, which has been introduced by M. de Chemant: this gentleman's invention merits much commendation, as it affords a more durable substance for those who, from acidity or some peculiar property in the fluids of the mouth, destroy artificial teeth made of osseous substances. However, these teeth do not sufficiently resemble nature." A deceased relative of mine, Mr. Joseph Murphy, of Leeds, who in his time was deemed an ornament to the profession, wrote on Dentistry about this period, and thus refers to the subject. "The artificial teeth called mineral are composed of baked earth, covered with an enamel flux, and coloured to imitate nature. Many of them, however, have but little resemblance to nature; their opaque livid appearance very much resembling earthenware. I am, however, of opinion that the art of making mineral or enamel teeth is still capable of great improvement." Under this impression Mr. Murphy applied to many of the English china manufacturers, and in the hope of getting teeth made under his own direction, shewed them specimens of mineral ones procured from Paris, and pointed out the objection to their colour. Repeated attempts were made by the potters, but their productions, instead of surpassing those of the French, as desired, were vastly inferior to them. It is probable that Mr. Murphy was deterred from trying any experiments on porcelain personally owing to the extensiveness of his practice, demanding almost his whole attention, and, perhaps, the want of success on the part of the experienced potters, discouraged him from the pursuit. He, however, procured mineral teeth from Paris annually, and though the colour was not satisfactory to himself his connexion highly approved of them.

At the present time, the French have attained to a very high degree of perfection in the preparation of these teeth. They are made with every appearance and every shade of colour incidental to the human teeth, and one or more can be fixed in the mouth to correspond so with the real ones as to preclude the possibility of being distinguished from them by any outward examination.

Several English dentists profess to manufacture these porcelain teeth; but as yet I have not seen any publication of the process. There is a diffidence existing amongst members of the profession, with respect to the communication of their experience, owing probably to the state of strong competition among them; but, perhaps, if this feeling were duly reflected on it might be found untenable from its irrationality. The only mode that I know of, by which empiricism may be checked in this branch of art, is by making its superior methods of practice known publicly; for, when this shall be the case, no one will chose an inferior article when a superior is to be had at as low a price, and of course at a cheaper rate. If persons requiring dental substitutes have no chance of gaining accurate information upon the subject, it is a mere chance whether they become duped or not; for instance, if a gentleman wanted some artificial teeth, and at the same time had no knowledge of the different substances used, of the vast improvement made of late, he would most probably go to the first artist he heard of, and if this were one of the old school, some animal substance would be thrust upon him by recommendation; but this would not be the case if the applicant knew more of the matter; so that it appears to me the practiser of the improved methods must be benefitted by publicity.

Many books have appeared in which the superiority of the mineral substance has been ably demonstrated, the defects of the osseous matter pointed out, and its use severely censured; but, at the same time, all that is intimated relative to the process of preparing this mineral substance is, that it is a mystery into which the author has been initiated. This is decidedly unfair, and has the semblance of a mean selfishness; for it seems the object of the writers to destroy the old system and reserve the new one as a monopoly for themselves. If they were desirous of doing away with a bad method, and substituting a good one, the new plan ought to have been published; had this been done the writer would have acted fairly towards the practisers of the unimproved method, by giving them a chance of progressing. It is because this was not done that animal substances are so extensively used.

Several new names have been given to the material of which these teeth are composed, some have termed it a sort of pearl, others call it terro-metallic, and various denominations have been given to this one substance, porcelain. This can only tend to create misunderstanding, and I think the old name porcelain or china, communicating as they do the properties of the substance, its beauty, cleanliness and durability, are highly preferable. 'Tis true that these names may excite prejudice with some people; it may be apprehended that the teeth are liable to fracture similar to other porcelain articles; but this objection can at once be removed by the artist who, if qualified to fix them properly, is always willing to warrant his work during a year's trial. If there be a flaw any where in the substance, or if it be unqualified to bear the action of mastication, the fact must be made known before long, by the breaking of the teeth, and such little danger is to be feared in this respect that honourable professional men are always ready to stand responsible for their soundness and durability.

Animal substances speedily discolour and wear out, the mineral neither discolours nor does it wear away, and though teeth of this nature are liable to accidents, they mostly last till time has altered the shape of the jaws to which they were fitted; when, of course, a new gold base and teeth, adapted to the changed form of the gum, are requisite.

There are three reasons that have deterred the majority of the profession from using porcelain; the first is, that they do not generally understand the method of its application to their art; secondly, animal substances are fixed with much greater facility; and, in the third place, a decrease of practice is feared to be consequent to the use of an incorrodable material, on account of its lasting quality. The first objection may be removed by a little perseverance; but, the second is one of a more stubborn character. Filing a piece of bone into the shape of teeth, or cutting the crown off a human tooth and fastening it on a plate, are processes requiring but little ingenuity or experience; most practitioners will agree to this, for in this department, it has been customary to get the aid of working jewellers, any of whom are found competent to the task, however strange it may be to them, so simple is the process. Here, then, exists a powerful motive to an indolent person, which motive can only be removed by the refusal of people to use these unclean substances. The third objection appears ill-founded, for certainly a much greater number of artificial teeth would be required if the public felt not a dislike to the material of which they are composed; indeed, we may rest satisfied that, when mineral ingredients are brought into general use, the art must be much more extensively patronized; for it will then be more worthy of support, and though fewer artificial teeth must be consumed by the individual, a tenfold greater quantity will be used by the mass of society.

It appears to me that the profession has no real interest in the preservation of the antiquated mode of practice; but, on the contrary, that it would be much benefitted by the immediate discontinuance of such bad methods. It is certain though, that the majority of practitioners will still continue to recommend the use of human teeth and those manufactured from bone, and the only hope that can be indulged in of seeing porcelain brought into general use, for the purposes of the art, is by making as public as possible the qualities of the rival substances.

There is one argument against the use of human teeth, which is a very powerful one: I have not made use of it because the facts, if they be such, on which it is based have not come under my own observation, and have been blankly denied by some members of the profession. Statements have been recorded by respectable men that instances have occurred under their immediate cognizance, wherein teeth having been extracted from the bodies of persons who had died of contagious disease, and these same teeth having shortly afterwards been placed by a dentist in the mouth of a healthy person, the disease, that had caused a cessation of life in the body from which the teeth had been extracted, immediately attacked the structure of the person into whose mouth they had been conveyed. The evidence of small pox having been communicated in this way rests on as good testimony as most of the propositions considered as medical facts. The practice, take what view of it we will, is one fraught with evil, and the sooner it is given up the better.

Porcelain, I have said, is a compound, the main ingredients of which are alumine and silex; the latter is to be vitrified, and to be so it requires the aid of a flux as well as the agency of powerful heat.

Alumine is the basis of alum, and may be procured from it by heat or precipitation. Alum is composed of alumine, sulphuric acid, and potash. If a quantity of it be placed in a crucible and submitted to an intense heat, the acid will be evaporated, and the alum and potash will be found remaining in the form of a white crusty substance. This is to be taken and pounded in a mortar, and then washed in pure rain water. To perform this latter operation a few spoonfuls of the powder may be thrown into a basin of pure water, and stirred up well; it may then be left to settle, and when the deposition has taken place, the water may be poured off. This water will carry the potash with it in solution, so that the deposit will be alumine.

Another way of procuring alumine is by precipitation. Let a quantity of alum be dissolved in pure rain water, then pour in ammonia; the ammonia seizes the acid, effervescence takes place, and the alumine is precipitated in a deposition resembling starch. Ammonia may be added and well stirred up in the solution as long as it produces effervescence, as soon as it ceases to have this effect on the solution, the vessel containing the latter may be left for a sufficient time for the precipitation to fall. The alumine will be held some time in mechanical suspension, but will gradually sink towards the bottom of the vessel. When this takes place as much of the water as possible must be drawn off with a siphon. The matter may then be allowed to settle for some time again, when some more water may be drawn off. This process of taking the water away may be repeated several times, and then the vessel can be placed in an oven, and the remainder of the water evaporated. When this has taken place, a white substance will be found at the bottom of the vessel, this must be powdered, washed in rain water, and then dried. The process of washing is performed by simply mixing it in water and allowing it to settle: the water is then drawn off with a siphon, or poured off gently, after which the sediment, which is alumine, is dried.

Alumine thus prepared is perfectly white, and may be kept for use in the shape of a powder, which, when mixed with water, forms the pure plastic clay of the potters.

This earth, called alumine, is the main constituent of the common clay found in almost every part of the surface of the globe; it is in this state generally so coloured by oxide of iron and other kinds of matter that it is unqualified for the manufacture of china; but, in some particular places, it is found exceedingly pure, and of a beautiful blueish white. It is generally found in this state in the neighbourhood of granite rocks. The streams that pass through a country abounding in granite will often be found to have their beds covered with a white layer of aluminous clay. This arises from the decomposition of felspar, which is a constituent of granite; the attrition of water in the shape of rain and runnels, acts powerfully on the felspathic portion of the granite, and is continually dissolving it and carrying away the alumine of which it is principally composed; this is carried by the streams, while they have sufficient velocity so to do, but as soon as the waters arrive at a more level bed, and are therefore more tranquil, the alumine settles down to the bottom in a layer of white mud.

In the Winter time the granite, while its surface is moistened by the rains, will suddenly have the watery particles by which it has been penetrated, expanded by the agency of violent frost. This expansion of course disrupts the surface of the rock, and a quantity of it is reduced to a mouldering state, and in the succeeding thaw the light aluminous portion is soon washed away into some bordering streamlet by which it is, perhaps, carried into a brook, in the stiller portions of which it will be deposited in beds.

The floors of the streams in the granitic counties of Devon and Cornwall, are in some places composed of this clay; it is cut away in masses and forwarded to the different potteries for the manufacture of porcelainous wares. It is also used for pipe making.

Beds of this clay, sufficiently pure for use, are found in almost every part of the world; it is the earth called Kao-lin by the Chinese.

Silex is the earth of common flint. The flint is calcined and reduced to a fine powder. A quantity of flints may be made red hot, and then suddenly quenched, after which they must be pounded fine in a stone mortar, some water may be thrown on the powder, and then poured off into a vessel. It will carry with it the finer particles of silex, and these may be permitted to settle, and then be collected and dried. In this way the flints may all be reduced to a powder sufficiently fine to be washed away, and collected in the manner above described. This earth is, perhaps, the commonest on the surface of the globe: it is a constituent in most stones, and sand is almost entirely composed of it. Silex is, when reduced to a powder, perfectly white: it forms the pe-tun-tse of the Chinese when united with potash.

The proportions in which the silex and alumine are combined to make a porcelain for teeth are various. A general rule, which must be observed, is, that the greater the proportion of silex the more transparent will be the china; or, otherwise, the greater proportion of alumine the more opaque. In making porcelain there must always be a flux used to aid the fusion of the silex; the best that can be used for dental porcelain is potash.

A good composition for teeth may be made of silex, two parts; potash, two parts; pure alumine, one part; dry potter's clay, one part; these must be well beat up together so as to be perfectly mixed. They had better be put in a mortar, and having been beat up sometime, water may be added to form them into a paste; this, after being well ground in the mortar, is fit for use.

Of this composition teeth may be modelled in the various shapes requisite; a few pieces of platina are then inserted in them, by which they may afterwards be soldered to the metallic plate. They are then gradually dried, and afterwards placed in an oven constructed for the purpose.

The oven may be made of Plumbago or Stourbridge clay, and fixed in the centre of a stove or furnace: it must have a pipe or chimney from it, to pass out at the side of the furnace so as to permit a person to watch the process of baking from time to time, and this pipe must have a moveable cover, so that when the state of the oven has been examined, the lid may be placed on and the heat kept in. The coke, when placed in the furnace through an aperture at the top, falls round the oven so as completely to encircle it, with the exception of the portion occupied by the tube. The top of the oven may be made moveable, and when teeth are placed in their position for being baked, the top can be put on and then the coke may be poured into the furnace and lighted up. A fierce glow of heat may be kept up in the furnace for twelve hours, and then, one of the teeth can be taken out through the tube; if this be baked sufficiently hard, the fire need not be fed any more; but, if it be not so, the heat must be kept up, and increased till the teeth are sufficiently baked, after which the fire is allowed gradually to burn out. The teeth are then taken out, and the best of them selected for further operations; the bad ones are thrown aside as unfit for use. The next process is that of colouring: the two colours required are yellow and blue—chromate of lead does for the former and smalt for the latter. The colour is moistened and put on with a pencil brush; the blue must be of the lightest shade. A mixture of one part silex and one and a half parts potash is next prepared, and carefully beat up with water into a paste, the consistency of cream. This is laid over the surface of the teeth; thick as possible upon the fronts, and as thin as possible on the backs. They are then dried, and placed in the oven again, where they receive about two or three hours fierce heat. On being taken out the potash and silex will be found to have melted into a good glaze, on most of them, those that are not well glazed, may have the operation performed again.

Excellent teeth may be made from silex and potash, the proportions being about two parts silex and one potash: the heat must be moderate or the substance will fuse into glass.

A beautiful porcelainous substance, closely resembling human teeth in colour, may be prepared from the impure silex of quartz pebbles, they must be calcined and reduced to a powder, and this worked into a paste by the aid of potash and water; the teeth are modelled in it and then baked.

Porcelain always contracts in the baking, and the teeth, however they may have been moulded to a plate, must, after they come out of the oven, be refitted: this is easily done by means of a small grinding stone, about the size of a shilling, fixed in a lathe. This instrument acts the part of a sculptor, and a little paint rubbed on the surface of the plate will enable the artist to detect the parts to be removed from the tooth in adapting it to the plate.

Coloured glass can be melted on the base in the shape of grinding teeth, and blocks for the sides made of this substance will be found to act most excellently. Glass of any colour, may be bought in the cane ready for use. All dentists ought to be provided with some of various colours, as it is useful in many instances; thus, in cases where a cavity is in front of a cutting tooth, the amalgam stopping is objectionable from its metallic appearance; but, if a small piece of thin platina be cut so as to fit the mouth of this cavity, and at each side of this a few catching points be soldered, glass, the colour of the teeth, may be fused on one side, and the cavity being partly stopped with amalgam, the catching points on the side uncovered by the glass, are pressed into the amalgam firmly, and in the course of an hour or two the glazed platina becomes fixed by the hardening of the amalgam : this operation, if neatly performed, must give the greatest satisfaction to the patient. It is two years since the idea of trying the experiment suggested itself to me, and since then I have often practised it, and I can say always satisfactorily.

When teeth are very much decayed, discoloured, or have their enamel much injured or disfigured, caps of gold, platina, or palladium, may be stamped up to fit them with the greatest exactness; the fronts of these dental caps must be glazed, and they can then be worn with much benefit.

The porcelain teeth, the mode of manufacturing which has been briefly but, I trust, sufficiently described,—when properly fitted and fixed on a metallic plate, adjusted to the mouth, are the best dental substitutes that can be made use of; their general introduction to use instead of those composed of animal substances, I have before shown to be, for many reasons, highly desirable. When properly fixed they answer their purpose as well as substitutes can be expected to do. The four principle properties by which they recommend themselves are their beauty, durability, cleanliness, and similarity to nature.

From what has been thus briefly said of the mechanical branch of Dentistry, it will be perceived, that the aspirant to it has much to study, and requires natural ingenuity to attain eminence; no man can be a good dentist without having a general knowledge of chemistry, and being a skilful mechanist. To acquire these abilities, the consumption of a considerable space of time, with much application, is requisite. An abstract knowledge of the structure and functions of human organization is indispensable, and the arts of the goldsmith, potter, and surgeon, have in some degree to be practised: the necessity for the possession of this knowledge and skill by the efficient practitioner, is what has expanded Dentistry.

In conclusion, allow me briefly to express a hope that the remedial operations, which I have noticed in a former part of this book as being so simple in their nature, will not be lost sight of. The members of the vast mass of society are not possessed of pecuniary means to avail themselves of the comfort of professional aid in this respect; but methods are now taken to disseminate useful knowledge among them, and it is certain that poverty is no reason why the artizan or labourer should not provide for the dental health and beauty of himself and family. The time required to be devoted to this object will be found to be very short, but pleasingly and instructively occupied; and the lasting benefits attained will most assuredly amply compensate for the trouble.

THE END.

INDEX.

A

Page

ABSORBENTS 15
Absorption in the sockets . . . 95
Acetic acid . . . . , . 99
Alum water, use of . . . 141
Alumine 192
Anatomical names 36
Assimilation 19

B

BARK, use of 141
Baron de Botticher's discovery . . 182
Bile 17
Blumenbach, quotation from . . 11
Bone used as a dental substitute . . . 175
Brain 12
Brushing 110

C

CELLULAR substance . . . 10
Chalk most unobjectionable as a tooth powder . 111
Chyle 17
Chyme 17
Colours for porcelain teeth . . . 199

D

DETERIORATED blood, influence of, on the teeth 75,86
Disease communicated by natural teeth . 191

INDEX.

E

	Page
EDUCATION	72
Elongated appearance of teeth	141
Exostosis	94

F

FRENCH porcelain teeth	185

G

GASTRIC juice	16
Glass teeth	200
Grafting teeth	179
Grooving disease	96
Gum boil	140

H

HUMAN system	10
Human teeth, use of	29
Hunter's experiment	62
——— mode of transplanting teeth	177

I

IMPOSITION	23
Inadequacy of the surgical art of Dentistry	144
Instantaneous cure for toothache	134

L

LANCET, unskilful use of, to the gums in infancy	55

M

MASTICATION	16
Monkey's teeth, use of	29
Muscle	11

N

NERVES	13

INDEX.

O

Page

OVEN for making teeth . . . 198

P

PORCELAIN, application of, to Dentistry . 183
Preservative tooth powders . . . 111

Q

QUALITIES of which artificial teeth ought to be possessed 175

R

RESEMBLANCE of childrens' teeth to those of their parents 83
Reaumur's discovery of porcelain . . 153

S

SAC, primary sacs 46
—— secondary sacs 51
Silex 196
Succedaneums 104

T

TARTAR 94
Teething 49
Toothache 83
Tooth drawing 143
Transplanted teeth 177

V

VITALITY of the teeth . . . 66

Wrightson and Webb, Printers, Birmingham.